

TECHNICAL DEPT.

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*The Oldest American Aeronautical Magazine*

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XXIV

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Stress Analysis in Commercial Aircraft

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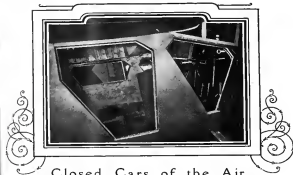




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**W R I G H T**



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## The Wright Plane

IT HAS long been known that Orville Wright intended to send the Wright plane which was flown at Kitty Hawk in 1903 to England for exhibition in the Science Museum at South Kensington. The proper and ideal place for the exhibition of this plane is the Smithsonian Institution at Washington but for some years this proposition has been hanging on an airless message intended to indicate that Professor Langley was the pioneer of heavier than air flight in this country. The Wright brothers quite naturally considered that their own efforts were slighted by the Institution. Orville Wright has postponed the decision of sending the plane to England for a long time but he evidently now feels that the time has come to take some action.

This decision will be greatly regretted not only by those directly connected with aeronautics but by the general American public. Professor Langley did a very important work but actually the Wright plane was the first to fly with a pilot on board and the modern plane resembles it more than it does the Langley tandem. There is no doubt but that the plane of later should not be the Wright plane. And it is too bad that the Smithsonian should allow the proposition to continue in the name of Orville Wright that the plane he and his brother flew is still not to be forgotten.

The only bright spot in the picture is the fact that the plane has only been lent to the Science Museum, and it can be recalled at the request of Mr. Wright. Americans are perhaps more interested in making aviation national than in exhibiting their claims to be the sole masters but to this particular instance the balance in favor of the plane is of such importance that it should certainly be kept in Washington and set in London.

## Planes and Summer Resorts

**T**HE MAJORITY of our most lovely summer resorts are a night's travel by railroad from the coast or a few hours' travel by plane. Now it has usually been assumed that planes cannot compete with a good sea or night train service and this is probably true in the case of business trips but in the case of pleasure trips the matter is markedly different. Few men will spend two nights in the country but they would well be willing to sacrifice part of their business day if they could fly to the same resort on Friday afternoon and return Monday morning. This would save them two full days and three nights in the country, and after all, from the point of view of pleasure the evening and nights are as valuable as the days. There is no doubt but that week end air service to

our summer resorts would prove popular. So far there have been two factors holding back this development. The first was the lack of really suitable equipment for high class passenger service. This has been largely overcome by the development of the closed cabin plane and especially the airplanes for most of the summer resorts are on the water. The second deterrent factor is that of the cost. A week end service is naturally expensive for the plane is only busy part of the week. The management of the resort could, however, very well afford to meet part of this expense. There would be considerable advertising value in such a service but what is more important it would really make it possible for business men to visit their families over the week end and it should then draw more and higher class families to spend the summer in resorts which have hitherto been considered inaccessible except during the holidays.

## International Air Lines

**S**INCE THE War Europe has developed a veritable network of air lines largely for political and military reasons, and all of them are heavily subsidized. Thanks largely to geographical opportunities the United States has developed a system of air mail routes which require no direct subsidy and many of which are already profitable ventures. So far so good, but the subsidy system may yet get out of hand.

Europe has realized that its short lines are of limited value and has planned to extend them to the colonies. Last year England inaugurated the first link of its service to India and Australia. The Latécoere line which has been operating between France and the African colonies, is now extending its service to South America. The connecting link between Africa and South America will be for the present by fast packet boat, but the air line down from Paris to the Senegal and along the African coast will mean that Europe will be very much closer to Brazil and Chile than to the United States.

It is evident that Europe plans to foster its foreign trade by furnishing quick transportation through the medium of subsidized air lines. The question is whether the people of the United States can afford to lag behind in this respect. If through the use of airplanes or dirigibles European mail can be delivered to South America in three days, whereas mail from the United States takes two weeks, there is little doubt but what we will lose a vast amount of foreign trade. As a nation we have never adopted direct subsidies, but if Europe develops a system of air lines to the East and to South America we may find ourselves in a position similar to that of a nation which did not have cable connections with the outside world.

# Methods of Standardized All-Metal Float Construction

By KENNETH D. VOSLER  
Factory Superintendent, Edo Aircraft Corp.

DURABLEMEN has long been recognized as one of the best materials for aircraft, especially for engine and flying boats, but its widespread use has been held back by the high cost of manufacture. The cost has been too high in the high price of the raw material as well as in the development of tools and manufacturing methods which were suitable to light alloys. Since 1926 the Edo Aircraft Corp. has been manufacturing floats out of duralumin for the convenience of light commercial airplane and seaplanes. The company has now reached a very considerable production of a standardized type of float and the methods of manufacture which it has developed are the results of much experience under the most limitations imposed by commercial value possibilities.

The aim of this article is to generally describe, in their proper sequence, the various manufacturing operations as now developed, their relation to each other, and the special tools and equipment relevant to each method and step of construction necessary to produce a standardized all-metal float.

In general, the standardized all-metal float structure consists of several frames set transversely every 20 in. and interconnected longitudinally by means of extruded duralumin members of half-angle sections. Alclad sheet covering applied to the internal framework carries all stresses and eliminates the conventional fore and aft bulkhead and the usual complicated internal trusswork.

The frames of floats of this type of construction consist primarily of an extruded duralumin half-angle section rolled to the correct float cross-sectional shape above the sheet

completed by placing a straight length of the right section in a cast iron form resembling the float cross-sectional shape above the sheet line, over which steel rollers, one at either end, are levered down following the curve of the lower ribs and form the angle sections in that exact and correct shape. It may be said to note here that no forming operation is



Fig. 1. Interlocking longitudinal strings with a pneumatic riveter type rivet.

then nature is performed on an extruded duralumin half-angle that has been out of heat treatment at 350 deg. Fahren. but more than twenty minutes. As this cast iron frame allows for the rolling of each member into and against side simultaneously, it eliminates any necessity for outside under line adjustment, which is found to be necessary in some cases when only one rib and side is formed at one time in a single forming fixture.

Since the corner radius on all types and sizes of standardized all-metal floats is the same, and as the two end ribs forming portions of the rolling fixture are easily adjusted in to distance between radii centers, the fixture is adapted to its use for forming frame members for all types and sizes of standardized floats. Simultaneously with the measurement of the frame angles, sheet Alclad beams and bulkhead members are cut to shape and drilled to template for punch to readily in stacks of twenty pieces at one time, and shaped in a rack using bending bars of special design ready for the next stage of frame assembly. All ground plates are finished out in green sand of a design providing for quick drilling of the finished floats.

From the operations just described the frame parts pass on to the master frame assembly jig, where the extruded frame members are placed in turn in a set and fastened to reverse the flat top of the frame under water.

used also in this form provide for accurate setting of the end ribs of the frame angle, after which the sheet portion of the frame or bulkhead is placed in position, accurately guided by down pins and slots providing the bottom flange of the member. All holes for stringer gusset rivets are drilled at this time by means of a portable electric high speed drill and drill jig, a part of the main fixture, having a different location fixed by bushed holes in the main part of the frame into which are placed the locating dowels of the drilling jig.

The frame members thus drilled for final assembly, and all loosely together by wire clips, pass on to the riveting gun and pneumatic bench type riveters for final riveting. Guided frames coming from the riveters are placed in complete sets in elevated racks of finished parts.

From the finished parts rack the frames pass on to the last stage in the actual assembly of a standardized all-metal float. They are placed in an inverted position on a steel section jig and held securely in place by means of a series of four operated cones which press the deck portion of the lower angle section against steel backing blocks, necessarily using only frames so indicated in its correct relative position without further adjustment. When all frames and bulkheads are thus clamped in position, the longitudinal stringers of extruded duralumin half-angle, previously cut and the panel, as needed in place. Special type pneumatic stringing machine has been developed for this particular operation and Fig. 2 shows one of the pneumatic stringing type riveters as in use installing longitudinal stringers.

The use of these pneumatic tools and other heavier appliances has been greatly facilitated by a system of rolling I-beams attached to the main building framework over the float assembly jigs. Two main I-beams roll from one side of the assembly across to the other, and on these movable beams, in turn, are installed ball bearing trolleys rolling the exact length of the movable I-beams and carrying Portway Roll E bulkheads. The pneumatic riveting machines and

other appliances are suspended by the bulkheads, leaving no weight of the tool to be borne by the operator and they may be easily moved to any part of any float on any jig for immediate use. A system of parallel wire attachment insures the parallel movement of each rolling I-beam. This system of rolling beams may be used as Fig. 3.

When all longitudinal stringers are in place the curved bow stringers and transverse step forming member previously drilled over cast iron pattern forms are installed and the skeleton assembly as it is now (Fig. 4) is ready for bottom



Fig. 2. The skeleton assembly ready for bottom covering.

covering. It is to be noted here that all bottom, side and deck covering sheets for standardized floats of all sizes are sheared and bent to shape from patterns and templates and kept in finished stacks available for immediate use on the completed skeleton assembly. The unique notched bolsters of the middle portion of the float (Fig. 5) is installed first, the curved shape being insured by the use of two cast iron frames mechanically drawn down over two stations, clamping the sheet correctly and firmly in place for riveting. As the eight main longitudinal beams are already in the sheet when it comes from finished stores, it assumes approximately the correct shape when opened up and placed in position on the skeleton structure. The cast iron frame assembly bolts

Continued on page 642



Fig. 3. A section of the Edo plant showing the various pieces of working equipment in operation. Note the system of rolling I-beams which greatly facilitates the use of heavy working equipment.



Fig. 4. Drawing of a typical frame of a standardized all-metal float.

line, to which is riveted a bottom structural member of sheet Alclad flanged at its upper and lower extremities for stiffness. Referring to Fig. 1 it will be seen that the shape to which the extruded duralumin section must be rolled consists of a flat top, reverse, corner radii and longitudinal sloping ends. The rolling of the half-angle section to this shape is easily ac-





Professor Alexander Klemm

By ALEXANDER KLEMM  
Daniel Guggenheim School of Aeronautics

Assisted by GEORGE F. TITTELTON  
Chief of the Bureau of Aeronautics Policy Department

### Chapter One

THE STRESS analysis of an airplane is merely the application of the first principles of mechanics to the structure of the plane under various loadings. The amount and distribution of these loads vary for different attitudes of the plane in flying and landing. The application of the same mechanical principles to each condition however, will indicate the internal stresses that are a maximum for that condition. A review of the general principles of mechanics, especially those most often used in airplane work, is a logical introduction to stress analysis.

Newton's first law "Every body continues in a state of rest or of uniform motion unless acted upon by an outside force" is the basis of that part of mechanics known as statics. If a body is stationary, all the forces acting on the body counterbalance each other and a state of rest or equilibrium exists. The balance of forces is usually indicated graphically as follows:

$\Sigma H = 0$  which means the sum of the horizontal forces is zero

$\Sigma V = 0$  which means the sum of the vertical forces is zero  
 $\Sigma M = 0$  which means the sum of the moments acting is zero  
When the forces acting on a body are not all wholly either in the vertical or horizontal plane these components are resolved in these two planes before starting computations. The horizontal force  $H$  is sometimes denoted by  $X$  and the vertical force  $V$  is denoted by  $Y$ .

In working with forces that vary in direction it is well to adopt a system of signs and adhere to them throughout. In Fig. 1 the signs of forces and moments are illustrated. Forces acting towards the right are positive, those acting to the left negative. In the vertical plane, up forces are positive and down forces negative. A moment tending to cause clockwise rotation is positive and an anti-clockwise moment is negative.

Thus the direction of a force determines its sign. A force

# Stress Analysis of Commercial Aircraft

## Review of Applied Mechanics

in addition to direction has a magnitude and a definite point of application. These three elements of a force should be borne in mind at all times in stress analysis work.

To break forces up into their components along the  $x$  and  $y$  axes we must make use of the trigonometric ratios  $\sin$  and  $\cos$ . Then the force  $AB$  may be broken up into  $AB \sin \alpha$  and  $AB \cos \alpha$  as in Fig. 2. The value of the  $Y$  and  $X$  components may be obtained by multiplying  $AB$  by the  $\sin$  and  $\cos$  of the angle respectively.

Thus  $AB \times \sin \alpha = AB \sin \alpha = Y$   
 $AB \times \cos \alpha = AB \cos \alpha = X$   
and since the force is acting to the right and upwards both signs are positive.

This resolution could be done graphically as well very easily. If  $AB$  is drawn to scale and in the correct direction,



Fig. 2

just measuring the lines  $AB \sin \alpha$  and  $AB \cos \alpha$  will give the numerical values of the two components.

The moment of a force about a point is the product of the force by the perpendicular distance from the point to the line of action of the force. A couple is composed of two equal forces, parallel but acting in opposite directions. The rotating moment of a couple is the same about any point in space. The value of the moment is the perpendicular distance between the forces times one force. Fig. 3a illustrates a moment caused by one force and Fig. 3b shows a couple.

In Fig. 3a the moment is negative because it is counter-clockwise. In Fig. 3b the couple tends to turn clockwise so its moment is therefore positive.

If we have three forces,  $A$ ,  $B$ , and  $C$  acting at a point and they are in equilibrium, they may be completely represented by the three sides of a triangle taken in order. See Fig. 4. It is to be noted that the sides of the triangle are each perpendicular to the force they represent and of the same length.

BASED ON 1930 when AVIATION was started very few books had been published on aerodynamics and it was very difficult for the ordinary student designer to obtain the data of aeroplanes on which to base his designs. To fill this gap it was decided to run a series of articles in the magazine in the principles of aerodynamics and for the first four months (Aerodynamics and Aerodynamics Engineering, as it was called), was largely devoted to these subjects. The writer, Alexander Klemm, was then comparatively unknown but his articles met with unusual success and seemed to fill a long felt need. He realized now the demand that when the series was completed the articles were put in book form and with one revision the book still stands as one of the foremost text books on elementary aerodynamics.

In the early days there have been many changes. Publications have established courses in aerodynamics and Professor Alexander Klemm heads one of them. The theoretical part done by mathematicians, the experiments made in the test tanks and the data gathered by actual flight tests have been widely distributed not only through the aerodynamics courses but through the Army and Navy technical services and especially through the work of the N.E.C.A. The moment aerodynamics has been greatly advanced and the knowledge is now made available in several reports and in personal text book form.

The book STRESS has brought forth a large production of commercial planes which comparatively speaking are very easily off-set. 1937 has also been the first year in which the government has awarded to the structural strength of commercial airplanes. The government inspection has shown that in almost all cases of commercial planes more planes and have had been put on obtaining aerodynamics

efficiency than on the details of the structure of the planes. This opinion has been confirmed by the repair work which has been going on quietly at all the airports. Rough landings have strained and broken parts that should have held, and new systems have been necessary. Examination of these struts and bracing has revealed that in most cases they were not due to bad workmanship but that the fault was back in the structural design.

The cause for this is not far to seek. Aerodynamics is an interesting subject even for the layman, the knowledge that has been put up in book form is widely spread about and forms a constant topic of conversation. The structural strength of aircraft is equally important but the subject is not as popular and so far it has never been put in a form where it can be available and understood by those interested in the design and construction of airplanes.

Professor Klemm who now heads the Guggenheim School of Aeronautics at New York University has associated to write a series of 30 articles giving the fundamentals of elementary stress analysis as applied to the design of airplanes. Professor Klemm not only has a very real knowledge of structures and their design but, more important still, he has proved that he can write in such a way as to impart his knowledge to others. The series of articles which will appear in AVIATION for the next few months will form a most valuable course in stress analysis and should be read with care by all those who are concerned in the design and construction of airplanes. The articles will be written with a view of helping engineers comply with the Department of Commerce stress analysis regulations and it is hoped that they will spread knowledge on a subject which has been comparatively neglected but which is essential to the progress and safety of aviation.

The original forces in a structure are down to earth, that is a very simple per se of length. If the three sides  $A$ ,  $B$ , and  $C$  are drawn to scale and in the proper direction and form a triangle for equilibrium of the system. This is illustrated in Fig. 5 for a number of forces acting at a point which are placed up to do not show. The dotted line which is used to find the  $y$  component in magnitude and direction the force used for equilibrium.

It is often called the equilibrium of the original system. As an equal and opposite to it would have the same effect as

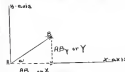


Fig. 3

is the plus or minus sign. Such a force is called the resultant of the original system.

When a system of forces exists that for every action there is an equal and opposite reaction. Thus the weight of a ship resting on the ground is counter-balanced by the supporting forces or reactions pushing up through the wheels

and keel keel. The reactions always come at the points of support. The action or loads however are not always over any particular point of support. The load is then practically distributed over several points of support. The ratio of distribution of a load between two supports is explained in

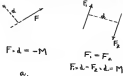


Fig. 4

Fig. 5. The further away from a support the load is the less force will it exert on that support. The reactions as according with Newton's law are always equal to the sum of the forces acting. It is advisable to add the reactions when determined and compare them to the total load. This will serve as a check on the arithmetic up to that point.

The application of the three equations of equilibrium will solve any structure that is statically determinate. Where a structure is more complicated, these equations will not solve

Continued on page 634

# The Supermarine-Napier S-5

Some Construction Details of England's Winning Entry in the 1927 Schneider Trophy Contest

THE FOLLOWING details of the construction of the Supermarine-Napier S-5, which was flown to first place in the 1927 Schneider Trophy Contest by Lord C. N. Wether, R.A.F., have been recently released by the British Air Ministry.

The Supermarine Napier S-5 is a twin float seaplane with a low wing semi-rigid construction. Three pieces of this type were entered in the Schneider Trophy Race last fall, two of which were the only planes to finish. They were fitted alternately with a direct drive and a geared drive Napier "Lion" engine of the broad narrow type having three banks of four cylinders each. It is noteworthy to note that in the Schneider Trophy Race the machine with the geared engine was nearly 15 m.p.h. faster than that with the direct drive engine. These engines developed 335 hp. at 3,500 r.p.m. weighing 845 lb. or 954 lb. per hp. for the direct drive and 120 lb. or 110 lb. per hp. when the reduction gear was removed. The structure of the plane consists of a monocoque fuselage finished with wood wings and duralumin pontoons. The wing plan established a world's record of 291 ft. x p.h. over a closed course of approximately 27 mi.

The design of the Supermarine S-5 was developed from the Supermarine S-4 which in 1925 set a world's record for sea planes. Though it is not advanced by the designers, there is a plan of about three miles as least due to the low wing and tailing in with the Napier engine as well as a high wing. This is more than compensated by the increased mass of vision. The wings are externally tapered both above and below by



Front quarter view of the Supermarine-Napier S-5 with its new engine and power installation.

streamline curves. This is said to give a considerable reduction in structural weight (15 to 45 per cent. over the S-4) which had had rectangular wings, and this, at the cost of a paper presented at January by R. J. Mitchell, A.F.M. A.R.S., designer of the Supermarine S-5, before the Royal Aeronautical Society, on the design of this plane, he stated that in spite of the addition of 14 external bracing wires the rela-



The Supermarine-Napier S-5 under construction at the plant of Supermarine Aircraft Works, Ltd., Southampton, England.

tion of resistance due to decreased weight, the elimination of the two struts formerly required between the floats, and the elimination of frontal area of the float mass chassis made the overall effect of increasing the speed by three miles per hour.

In speaking on the design of the floatage pontoon, R. Mitchell said that the cross sectional area of the floatage had been reduced by about 30 per cent. It was found that the new installation room on the floatage for the float, and it was placed in the starboard float as an offset load. This position for the float had a number of advantages. It bore the center of gravity of the machine, thus improving its stability in the air and on the water, and it also balanced the engine torque when accelerating in the water, and to a certain extent during flight. The reduction in body surface was responsible for an increase in speed of approximately 11 m.p.h.

## Float Frontal Area Reduced 15 Per Cent

According to Mr. Mitchell, the floats were also reduced in frontal area by about 15 per cent. This was accomplished by a much lower reserve buoyancy. The reserve buoyancy was 50 per cent. for the S-4 floats and 40 per cent. for the starboard float of the S-5. The attached reduction in speed due to reduction in float resistance is 4 m.p.h. These reductions in resistance of floatage and floats are due to less cross sectional area and not to improvements in form.

The floatage is heavily large enough to house the pilot. The beam of the rear floatage are so arranged that the top of the body is rounded off to fit over the shoulders of the pilot and his head is then in line with the control system cylinder block. It is also evident that there is a small gap in the top fitting just where the pilot's head is, and for about 1 ft. in forward of this, the fitting has triple glass on the top

Continued on page 633

# Airplane Factory Inventory

Increased Stocks Due to Increased Business Necessitates Western Firm Adopting Systematic Plan of Taking Inventory

By WILLIS PARKER

IT IS quite likely that Jan. 1, 1928, was the first time that aircraft manufacturers have been faced with the serious task of taking an inventory of stocks on hand. Perhaps no one in years past had the magnitude of their inventory as yet such that counting only bolts, yards of fabric and lengths of boards and steel tubing required a systematic plan. This was the experience of a western aircraft company that recently completed its first bottom-to-top inventory, although the year before it accomplished an satisfactory inventory under the same.

Doing to the vast amount of stocks of raw materials, finished parts, etc., on hand, the management felt it necessary to set down procedures between Christmas and New Years and devote the winter to the inventory. This, perhaps, was actually because of the peculiar system of dealing out raw materials and parts for the construction of such and every piece had to avoid confusion and errors in counting. It was advisable to divide the inventory into two sections, one devoted to material to process and the other material in the stock room. It is obvious that it would be difficult to count the material in process if the manufacturing of planes continued while the inventory was under way.

## All Material Requisitioned from Stock Room

Perhaps a description of how this particular firm took its inventory will prove of interest to other aircraft companies in the future.

The company was a stock control system whereby all materials required for a plane must be requisitioned from the stock room and fully accounted for. All raw material is shipped to the plant upon which it is to go. Likewise all raw material which is made into finished parts is requisitioned and shipped to the department manufacturing the parts, after which they are returned to the stock room and the manufacturer appears as a sale and a purchase on the books; a sale of raw materials to the manufacturing department to make the parts and a purchase of these parts by the stock room after they have been completed.

The accounts, then, for the two classes of merchandise to be inventoried. As the factory superintendent of the company explained:

"We draw raw material, finished parts made by job and not returned to the stock room to be drawn and again by requisition, as stock room material. Material in process is all material requisitioned or bought for a specific job or previous order. As soon as a requisition has been issued the material leaves the inventory and is immediately charged to the job for which it has been drawn and then it is known as Material in Process. When it is requisitioned it should be placed by the Factory Order, General Order or Repair Order in which it is drawn.

"We had laid out plans for this inventory several weeks prior to taking it, and one of the instructions to the factory workers was to try to complete all orders in process before December 31. We also requested that each department see to it that all requisitions drawn for a factory order, general order or repair order were filed and that the merchandise was transferred from the stock room to the department by December 31. Other instructions were—

"Carefully record any parts on a specific order that have been completed and transferred back to stock room even though the entire order has not been completed.

"List requisitions which have been sent to the assembly's department for recent jobs for which material is not so hard to get.

"The stock record department will make a written list of all orders not completed in each department at the time of inventory taking and report to the accounting department the last requisition number used December 31, 1927.

"For the assistance of the men taking the inventory of the raw materials, we instructed them as follows—

"1. See that all material that has not been drawn for a specific job or order is returned to the stock room as it was requisitioned in raw material.

"2. See that all material that has been drawn on or for a specific job or general order is gathered together and identified by factory order, general order or repair order number.

"3. Sort all raw material of a kind together so it can be easily counted and tagged.

## Pre-Inventory Work Necessary

"These orders were issued before the inventory was started and the men had sufficient time to gather all material in its proper place. Since there are more than 1,000 parts going into one plane, it is obvious that unless we had done some pre-inventory work in the matter of identifying materials and parts into their proper place, taking the inventory would have required more than the seven days devoted to it.

"Out of our crew of 150 workers, we selected about 20 to accomplish the inventory and divided these into the three departments: stock room, wood shop and welding department, in proportion to the amount of materials stored in each of these departments.

"We had ten thousand tags printed, each serially numbered. They were assigned as follows—

"One to six thousand to Stock Room 34. Five to six thousand to Stock Room 35. Six to seven thousand to departments having raw material not kept in stock room—Seven to ten thousand to departments having material in process.

"The tags assigned to each department not only could be

Continued on page 630

# Aviation in North China

Little Development up to 1925, but Since then French Assistance has Made Rapid Progress Possible

By GEN. D. E. SWINERT

(His Address is Chang Kai Shek)

AVIATION PROBABLY is newer in China than in any other country. And why should it not be so when the people consider "their country" to be limited to a relatively small circle surrounding their homes? For instance, while having pleasure in south central China I once came across an old farmer working in his field. I pointed to some hills about five miles distant and asked, "Are there any planes in those hills?"

"That is not my country," he replied. "I have never been there."

Now he was a typical Chinese farmer. He did not know the hills four miles away. He didn't care what was happening at that distance, he only wanted to be left alone and allowed to carry on his work.

Yet is the face of this prehistoric point of view, aviation is making tremendous strides. I remember that as recently as 1922 Chang Kai Shek, leader of the 150,000,000 soldiers of north China, had only 12 planes. At that time he had no one with him who understood even how to assemble these planes, which then were stored in a warehouse at Mukden. After his defeat by Wu Pei Fu in 1922 Chang Kai Shek decided to acquire his number of planes and to obtain personnel capable of handling them. Captain McCord, an Australian who had flown with the Royal Air Force during the World War, came to serve Chang Kai Shek, though a capable and experienced pilot, he failed to understand the Chinese and did not have the patience necessary for instructing the Chinese in flying. Accordingly in 1925 he was superseded by two French officers. Since that year French methods and French ideas have been predominant in aviation in north China.

The real development dates from a conference between Marshal Chang Kai Shek and D'Udenot, the French air who in 1925 made a flight from France to Japan. He stopped in Mukden and had a conference with Chang Kai Shek and his return to France was followed by the sending of six young French air pilots to China. They are acting as instructors in Mukden.

The "Young Marshal", Cheng Hsiang-sheng, is director of aviation in North China. Although he holds the rank of a field marshal and has been in command of troops since his 18th birthday he is not personally interested in military aviation, but in the commercial phase. When one brings up to him the subject of flying he always grows enthusiastic over the future of commercial flying in China. He has

drawn up a plan for a network of commercial airlines over China. Unfortunately he has been unable to develop this plan because of money needed for military matters. The larger sums of money needed for military operations has made it impossible to use any money for the development of commercial aviation.

Now we have a strange situation in China. There are practically no roads. With the exception of freight carried by the railroads and to a small extent from Manchuria to North China in the south, the freight in China is carried by man power entirely, making the freight rate higher than in any part of the world. Owing to the enormous cost of building modern roads and the amount of money that must be expended before any showing is made, I think have wondered if China will not skip the age of automobiles and go directly into the age of airplanes.

The cost of fuel is very high in China and so the cost of labor is so cheap that there has been a tendency to use manpower rather than machinery. Yet, from the advance made in aviation in Europe and America it will not be long before aviation will be the principal means of transportation in China. What can be done by the Chinese in developing commercial aviation is discussed in Mukden. There, under the Young Marshal's direction, has been developed an aerial which I believe to be second to none. There are now in the 200 planes at the 1931. Most of these are of the French type, the Hispano, although there are a number of large Vickers planes taken over from the Peikin government in 1925. There are also three or four old Curtiss planes that were captured from the southern army. The probable origin of those was Hanks; this, however, is only a conjecture on my part, as a very strict opposition to kept over airplanes from Italy to Mukden, China.

Although the French have been active in securing business in China, I believe the attitude of the American air department has kept American airplane manufacturers from dominating aviation in North China. Japan, Great Britain, France and the United States have entered into an agreement not to ship airplanes of war to China. Other nations than the United States have provided the shipment of airplanes for commercial purposes, however. It is true that airplanes have been used very little in the north west in China, and I believe France was justified in allowing shipment of planes for strictly commercial purposes.

Gen. D. E. Swinert

Continued on page 438

## Willhelm Oil Co. in St. Paul Buys Waco for Use in Sales Territory

THE WILLHELM Oil Co. at 2631 Hampshire Ave., St. Paul, a manufacturer and distributor of Willhelm Diesel Lubricants, has purchased a Waco 19 for use of the company's district in territory and the quick business light.

E. L. Gutterman, vice president in charge of sales, hopes to get on track in a week during some of his regular stops.



E. L. Gutterman ready to take off in the Waco 19 owned by the Willhelm Oil Co.

ten trips by covering the field in the "Spirit of Lubrication", the new Waco is called.

The New American Oil Co., Ltd., of Winnipeg has been purchased by the St. Paul concern, and E. L. Gutterman is also its president and general manager of this new subsidiary. He plans to further use the plane in connecting between the American and Canadian headquarters. Sales across the border are on the increase according to present indications, and it is the intention of the company to purchase another plane to cover this additional territory with Winnipeg as the base of operations.

The "Spirit of Lubrication" is the plane which Gene Shank used in making the short-haul world's record of 816 hours on Feb. 4 in a 4 hr. 25 min. flight over St. Paul Municipal Airport.

## First Airplane Under Construction At the Bourdon Aircraft Factory

CONSTRUCTION OF the first airplane has been begun by the newly reorganized Bourdon Aircraft Corp., at the St. Louis airplane factory, Greenview, B. I. The plane is to be ready for flight testing April 7. It is to be named the "Emmyline" after the starting point of the Wright Brothers' historic flight, and because of the designation, "and by the back and land like a cat—always ready and up."

The craft has been designed for air-cooled engine, the first Bourdon engine having been shown as standard. The first plane will be built around the 7 cylinder 100 hp power plant and will sail for from 64,000 to 80,000 pounds. The airplane with 125 hp. engine will sail for about 92,500 more.

A smaller plane is to be designed later for sport and instruction use later with the 5 cylinder engine.

The corporation was formed by Harold Deussen of Boston, owner and operator of the Deussen Airport at Atlantic, near that city. Allen P. Bourdon, his chief pilot during 1927, is general manager of the new concern while Franklin T. Clark, a former pilot of the new concern, will be chief pilot. Clark, a former pilot for Deussen last year and almost chief pilot this year, is treasurer and chief engineer. Clark was formerly president of the Massachusetts Institute of Technology Aero Club.

Both Bourdon and Clark are transport pilots. Bourdon learned to fly in 1911 with the Gallatin people.

## Aero Craft Mfg. Co. of Detroit Formed to Produce New Biplane

ORGANIZATION OF the Aero Craft Mfg. Co., Inc., an addition to Detroit's airplane industry, was announced recently by Capt. Ernest W. Brown, the new company's president. A three place, semi-rigid, biplane equipped with a 16 hp. semi-cylinder, radial air-cooled Warner engine will be manufactured, according to Captain Brown. The engine is now being developed by the Warner Aircraft Corp. of Detroit. Fitted with dual control and capable of very maneuver from its ground position to a climb rate to the plane will be an air purpose craft. The fuselage will be ribbed with steel tubing and covered with fabric. Its wings, 30 ft. in span, will be constructed of the conventional wood and fabric. Split type landing gear, with a track of six feet, will be used.

The company's first plane, expected to be completed by April 1, will be exhibited in the All-American Aircraft Show to be held in Detroit, April 14 to 21 and later may be entered on the National Airplane Reliability Tour, Captain Brown stated.

Other officials of the new corporation are: Frederick West, vice president; Ernest W. Brown, treasurer; Capt. Carl E. Brown, secretary. Captains Brown and Squier are officers of the 18th Observation Squadron, Michigan National Guard, both were Army pilots during the World War. West and Squier are co-owners of the Porcine Pattern Works of Detroit.

The company's factory site has not been selected although the first product is being constructed in Detroit.

## Spokane-Portland Passenger Line Will be Inaugurated Next Month

SPokane's FIRST regularly scheduled airplane passenger line will be established by the Western Flying Service between Spokane and Portland about April 1, according to an announcement made recently by Pilot N. R. Manner. Pilot Manner and his associate, Clarence Padden, will start the service on a twice-weekly schedule, with the Buell Air Sedan a cabin plane, making two scheduled round trips each week. As the business flying schedule of daily trips, according to Mr. Manner. A detailed schedule of times has not been set, but a tentative charge of \$20 for a one-way fare and \$30 for the round trip is being considered.

The flying time between Spokane and Portland will be about three and a half hours, which means that planes leaving Fells Field at 4 A.M. will arrive in Portland before noon. Intermediate stops between the two terminals will depend largely on the nature of the business.



## Hydrographic Office Issues 10 Coastal Charts for Pilots' Use

TEN COASTAL charts for aeronautical use have been prepared by the Hydrographic Office, according to a Navy Department announcement, and 10 more are to be ready for issue by April. The entire set is to cover the coasts of North America, the Northern Coast of South America, the Philippines, and the Hawaiian Islands.

The charts already issued cover routes from Maine to Miami, Fla., from Miami to the Isle of Pines, and along the coast of Cuba to Haiti. Of the 10 as yet unpublished, five will cover the route from Havana, Cuba, to the Panama Canal, three the path from Key West, Fla., to New Orleans, and the remaining three a route from San Diego, Calif., to Honolulu Bay, Calif.

The charts have been prepared for the use of sea plane pilots. They are in strip form, facilitating their use during flight. Landing fields both commercial and military, airplane accommodations, harbors, etc., are shown with symbols while distances and magnetic courses are also given. Light house markings are accompanied by small pictorial objects. Safe actual soundings are given. A grommet speed table scaled in 10 knots are speed and giving the correction for wind angle and wind force between 5 and 20 knots, is also included as well as a great deal of additional navigation information.

Most of the charts are of a provisional nature. They are sent to aviation units with the request that additional information gathered by the user be sent to the Hydrographic Office for incorporation in standard charts to be published when complete knowledge of the coasts has been gathered.

## L. M. Woolson is Named Chairman of Aero Branch, Detroit Section, S. A. E.

AT A special meeting of the Detroit, Mich., section of the Society of Automotive Engineers held recently at the Book Cadillac Hotel in that city for the purpose of organizing an aeronautical branch, Capt. L. M. Woolson, aeronautical engineer of the Packard Motor Car Co., was named chairman. To assist him in the organization work Captain Woolson appointed a committee composed of William Marley of the Stinson Aircraft Corp., Irvin H. Driggs of the Driggs Mfg. Co., Wm. H. Stunt of the Ford Motor Co., Jack Waltham of the Telenor Oil Co., and Ralph H. Upson of the Aircraft Development Corp.

A. J. Cederqvist, in charge of the standardization work of the Society at large and chairman of the aeronautical sub-division of the Standardization Committee, pointed out during the meeting that committees were now working on standards for storage batteries, standard steel tubing, iron, aluminum, etc. Mr. Cederqvist emphasized that standards must be based on experience and come from definite needs.

Captain Woolson stated that standardization of standard parts had effected a 25 per cent reduction in the cost of all cars, and that a similar or larger reduction in airplane costs. Deterring costs could, in his opinion, be secured by similar efforts. The standardization of engine parts to take care of the many new types of engines now under construction was a subject which Captain Woolson thought should receive its immediate attention.

Captain Woolson also gave some interesting information on the success of the Stinson Aircraft Corp., at Northville, Mich., as an example of success with progress.

"Two years ago," he said, "Bill Taylor and Eddie Stinson built an airplane suitable for passenger work. Last year they

add 50 of these airplanes, and 50 per cent of them were sold to private individuals and business men who had the sense to come in and put down five times the price of an airplane. The industry is to be congratulated on securing this type of airplane customers."

W. C. Taylor, chief engineer of the Stinson Co., outlined the principles of a Detroit airplane engineering section of the S. A. E. Mr. Taylor said in part: "Last year we sold one airplane sold over 50 airplanes. This year we estimate we will sell over 100 similar planes, but we are still considerably in the dark as to what the public wants. I believe we will have to design smaller planes of lower horsepower, suitable for use as cars. sooner or later you will all have your own planes, and this is one of the ideas underlying the committee now being formed."

One of the main functions of the new section is the voicing of expressed opinion on engineering and structural requirements for Department of Commerce approved type certificates.

### Increase of Aeronautical Students

As an indication of the increased interest in aeronautics in the schools throughout the country, Professor Lane of the University of Michigan stated that there was an increase of 50 per cent of students taking the aeronautical course in that institution.

J. T. Whittaker, aeronautical engineer of the Telenor Oil Co., spoke to the meeting on the interest shown in aviation by business men of every city, town and village of the land. He spoke of the record during a recent 25,000 mile air tour made in his company's Stinson plane. The speaker added, Mr. Whittaker pointed out, now almost always on practical subjects regarding airplanes, motors, costs and the ability of different types of airplanes.

The meeting was thoroughly representative of the aircraft and aircraft accessory and supply segments of the Detroit district. Among the aircraft manufacturers represented were Stinson, Ford, Buick, Driggs, and Grumman. Apparently the vote to affiliate with the S. A. E. through the Detroit section was unanimous.

## High Speed Engine Piston Ring Developed by Baltimore Company

A NEW improved piston ring was recently announced by the American Hammered Piston Ring Co. of Baltimore, Md. The ring is of the "ventilated" type designed especially for high speed engines. It is characterized by large, deep



Photograph of the new high speed vapor piston ring developed by the American Hammered Piston Ring Co.

speed slots through the crown, with smaller grooves above and below these slots. There are four scraping edges to remove excess oil from the cylinder walls, while the central groove carries a constant supply of oil for lubrication at high speeds. The rings are constructed to give them the correct amount of tension and keep the scraping edges in firm contact with the walls.

**100,000 MILES!** The equivalent of four times around the globe. Yet each of the two Valsparred Laird planes which won first and second place in the National Air Derby, New York to Spokane, has flown this distance!

E. M. Laird, President of the E. M. Laird Airplane Company, builders of the planes in question, writes us:

"One of these planes has been in service for 18 months and the other for over a year, yet the Valsparred surfaces are still in excellent condition."

With records such as these piling up year after year, can you wonder that the whole aircraft industry continues to regard Valspar as the aircraft finish?

## Newly Formed Roth-Downs Airways Distributes the Travel Air Plane

**IMPETUS** WAS given to the airplane industry in the North Central states with the recent formation of the Roth-Downs Airways, Inc., St. Paul, Minn. The organization, which carries an authorized capital of \$150,000, has secured the distributorship of the Travel Air planes in the State of Minnesota as well as sales rights in North and South Dakota. The territory will be sub-divided and dealers appointed as soon as convenient permit.

Ten Travel Airs have been ordered for the first part of the year. These will be brought to the headquarters in St. Paul as quickly as they can be finished by the factory. According to plans, a plant will be set up at the St. Paul Municipal Airport and another at the Curtiss-Wright Airport, also in St. Paul.

The customary Spring field activities will be carried on by the new company including a ground and flying course. An engine office and the ground school will be maintained at 385 Cass Avenue of the capital city, the factory location of the Roth-Downs Mfg. Co., with which the corporation is affiliated through stock ownership.

Present officers of the Roth-Downs Airways are: B. W. Downs, president, Harold L. Rothchild, secretary, and Edmund S. Ward, chief pilot.

## REVIEWS

THIS "LINE of Position book" by Louis Comdr. P. V. E. Mrems, U.S.N., which has just been published by the U. S. Naval Institute, is a most excellent example of what may be accomplished in the reduction in size of navigational tables. The whole volume of only 64 pp. by two inch pages contains all that is necessary, except the data of the actual altitude, for the determination of celestial lines of position at sea or in the air.

The method of computation employed is remarkable for its simplicity, the only calculations required for obtaining the calculated altitude being one arithmetical and two algebraic additions entirely free of interpolation. The amount is sketched easily and accurately by means of a diagram comprising only four pages of the book.

The reviewer to the book may be dangerously surprised at first noting the apparent length of the calculations shown in the illustrative problems given, but it should be remembered that more than two-thirds of the space is devoted to selection from the line of bearing angle and to the application of the necessary corrections to the observed altitude. It is unfortunate that Commander Mrems failed to include at least one problem illustrating the short methods of calculating the hour angle and of reducing the altitude which are permissible in the aerial navigation, as the advantages of his method would then be more apparent.

Unlike most short navigational methods this one does not sacrifice accuracy. The method does lose accuracy somewhat when the observed body is near the horizon or the north but as these are cases where the navigator naturally avoids because of the difficulty of getting good sextant readings, it does not militate against the method.

It is believed that Commander Mrems' book is the first which takes deliberate cognizance of the needs of the aerial navigator. The tables for the reduction of the observed altitude include special columns for the correction of bubble sextant sights. These columns are applicable to sights taken with

such sextants as the Bureau of Standards (U. S. Navy), Williams Oceanic, or West Davis sextants, which instruments give altitudes of the sun's center. The book also gives the height of eye corrections for altitudes to one thousand feet and a therefore of use to an aviator who is using an altimeter as part of the sea horizon. An "Anonymous Speed-Time-Altitude Table" and a "Circular Conversion Table", which latter gives the angle of drift for various wind directions and forces, are also included for use in aerial dead reckoning.

The book is in no sense a text book on navigation, a presupposition a knowledge of the elements of the service and contains only enough explanation to illustrate the particular method used. The author has kept very closely to his subject, the Line of Position of the practical navigator, and has avoided all tables or arrangements which partake more of the nature of astronomy, surveying or mathematical navigation. In these respects one who is properly based in navigation will appreciate the compactness, directness, and simplicity of the reader Mrems' work.

## Midwest Airways, Milwaukee, Wis. Appointed Agent for Ryan Planes

THE MIDWEST AIRWAYS, Inc., with offices at the Milwaukee County Airport, recently became distributor of the Ryan airplanes for the State of Wisconsin. A Ryan airplane has been placed in from Los Angeles by Elmer Lutz. He was accompanied by James M. Knapp, president of the Midwest Airways, Inc.

The trip of 2,500 mi. was made in 24 hrs. Spring time was spent at Tucson, Ariz.; El Paso, Tex.; Abilene, Tex.; Tulsa, Okla.; Kansas City, Mo., and Chicago. The cabin of the plane accommodates five passengers and is equipped with a heater, curtains, air shades, and luggage compartment. It has every modern convenience including landing lights built into the wings, a starter on the engine, wheel brakes, emergency parachutes, and doors for night flying. Its best speed is 140 m.p.h., of gasoline, while the speed that may be obtained is 145 m.p.h.

The plane is now being used in the regular service of the company, which includes extensive passenger service, pleasure trips, aerial photography, etc.

Officers of the Midwest Airways, Inc., include Mr. Knapp and Val Zimmerman, vice-president and Ed. M. Knapp, secretary-treasurer. The company is also an agency for the Englewood plane.

## B. Russell Shaw & Co. to Re-Design And Improve Airport at St. Louis

LANBERT-ST. LOUIS Field is to be re-designed and improved under the direction of B. Russell Shaw & Co., airport construction engineers, it has been announced. The field will be lighted and the drive wheels installed, as well as other important improvements for the City of St. Louis pending a \$1,000,000 bond issue next November, has passed an emergency measure, carrying a \$500,000 appropriation with agreement to purchase Lambert-St. Louis Field for use as a new municipal airport.

The airport is being established on a seasonal to Colton Leachfield, it being the field from which he flew on the St. Paul line from St. Louis to Chicago before his later retirement.

The acquisition of the Lambert Field by the city follows the recommendations made by Mr. Shaw. The Greater St. Louis airport survey made for the city last year.

10000 fans receive this magazine every month



An Alexander contribution to the industry — it helps the plane owner

## Creating Airmindedness, Aviation's Foundation

and acquainting the public with Englewood

**A**N Englewood publisher receives more than an airplane for his money. He obtains the services of a great organization prepared and equipped to meet him in making his ship pay a profit.

He buys the good will and popularity of a product made familiar to the public through a remarkable performance record, 13,000 copies of *The Aircrafter* magazine made month, various prizes advertising, all 400,000 of the 1938 Reed McNally state map covers, thousands of windshield stickers, display advertisements in national aviation magazines and direct mail advertising. In addition there is the support and good will of a sister

organization, the Alexander Film Co., which has one hundred exhibitors, 10,000 customers and accounts with 2,000 motion picture theatres men and operators.

In two short years the Alexander Aircrafter Co. has reached a production of 28 ships per week, appointed 28 distributors with 75 dealers and has 175 orders on hand.

An Englewood distributor or dealer becomes the owner of a prosperous business. We help him to make money — INSURE that he be successful. We require none of our representatives because we do more for them.

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## New Orleans-Mexico City Passenger Service to be Inaugurated June 1

**ANNOUNCEMENT** OF a regular airplane passenger service, between New Orleans and Mexico City commencing June 1, has been made by the Mexican International Airways Inc., of which Col. George B. Houston, head of the Museo Caba air line is president. Capitalization of the company is said to be \$1,000,000 and several business men in New Orleans, prominent in banking and business circles, are said to be in the board.

The planes, winged and all-metal, will leave New Orleans at 7 A. M., and reach Mexico City at 8:30 P. M., twice a week. There will be five such planes operating out of New Orleans, each costing \$250,000. Each will have every modern convenience. A restaurant, smoking room, and sitting room, besides the regular seating accommodations for 12 passengers, will be included.

Landings and take-offs will be made at Collesville Field, New Orleans. It is thought that a quarantine station and customs office will be created at this field.

The route of the air transportation from New Orleans will be Houston, Brownsville, Tampico, and Mexico City. Branch offices of the company, which will have its headquarters in New Orleans, will be in Memphis, Chicago, New York, Detroit and Atlanta.

Colonel Houston, a long-veteran during the Spanish-American war and veteran of 24 yr. service in the U. S. Army, will make his home permanently in New Orleans. It is said he is resigning the presidency of the Museo-Caba agency to head the Mexican International Airways, Inc. The establishment of the service will give a continuous air route from New York to Mexico City and will mean a 30 hr. delivery of mail between those cities.

## Gates-Day Aircraft Corp. Moves To New Offices in Newark, N. J.

**TO ADEQUATELY** handle the large increase of business in the metropolitan area, The Gates-Day Aircraft Corp., and its operating subsidiary, The Gates Flying Corps, have selected a new headquarters at 311 Newark, N. J. The operations of the corps, including airport, the Gates Flying School, and of incidental aerial advertising and photographic projects is now being directed from the new offices. The move is at present taking the form.

Ives H. Gates, president, Charles H. Day, vice president and chief engineer, and George Davis, secretary, are now in Newark. Clyde E. Fougere, chief pilot in charge of operations, is traveling with the corps and will return to Newark later in the season.

## Alexander Aircraft Co. Engineers Developing New Air-Cooled Engine

**COMPLETELY DESIGNED** by engineers of the Alexander Aircraft Co., Denver, Colo., a new five cylinder air-cooled engine is now in the stage of development under the supervision of C. C. Hunsaker, production superintendent, and W. D. Campbell, engineer. Although official tests of the engine are to be made shortly, complete details have not as yet been announced.

Should the first five cylinder engine be the success hoped for, development of a seven and nine cylinder engine is to follow. The test engine is of 4½ hp with a 5½ stroke developing a compression ratio of 8.5 to 1. It is to be a complete development of the motor.

## Bid for Air Mail Line to Border As Service to Mexico is Assured

**BIDDING HAS** now begun for the operation of an air mail line between New Orleans and Laredo, Tex., via Houston, according to an announcement by W. Irving Glover, second assistant postmaster general. This follows the receipt of a telegram from Camilo Blazquez, director general of posts at Mexico, which assures early trans-border mail service.

The Mexican Government, stated Blazquez, is preparing to inaugurate an air mail line between Mexico City and New Laredo, across the Rio Grande from Laredo, Texas, and is asking when the American Government will be prepared to connect at that place for international operations. Mexico also plans a spur line from Mexico City, to Tampico, the idea being that Mr. Glover replied that the American Government would be pleased to connect with the Mexican system as soon as their plans come to the border.

### Must be Ready for Service

To meet this situation he is instructing the Texas Air Transport, operating from Dallas, Fort Worth, Waco, and Austin to San Antonio, to be prepared to inaugurate service at a moment's notice between San Antonio and Laredo in accordance with the terms of that company's contract with the Post Office Department. This route connects at Fort Worth with the National Air Transport which holds the contract for mail routes between Dallas and Chicago, and Chicago and New York.

The New Orleans-Laredo route which it is to be advertised will not be ready for operation until late in the summer but will, when inaugurated, represent a substantial saving in time between Dallas and Chicago in the dispatch of mail from New York to the Mexican border.

A part of this route, extending from New York to Atlanta, Ga., is expected to be placed in operation April 1. The Department of Commerce has announced that the Signal Corps under construction since the outbreak of war from New York to Atlanta will have been completed by that date and new routes have been moved from the Panama Aviation Co., its contractors, that it will be ready to operate then.

The Department of Commerce, however, will have a final available until after July 1 for the creation of necessary landing lights between Atlanta and Mobile to maintain the schedule suggested. The line between Atlanta and New Orleans already under contract and will be placed in operation as soon as the army is lighted for night flying.

## Col. Charles A. Lindbergh Receives Woodrow Wilson Foundation Award

**IN RECOGNITION** of his contributions to international goodwill and for his lighting of the bonds of friendship between the United States and its Latin-American neighbors, Col. Charles A. Lindbergh is to receive the Woodrow Wilson Foundation award for 1928 according to the Wilson Fund and \$25,000. The common is a special one, made the award for the award in December 26, Woodrow Wilson's birth day.

Colonel Lindbergh is the third to be honored. The first was Vincent Goff of Cleveland who was named recipient in honor of his "unwavering service of a public education leading to the establishment of peace through justice." Edna Kent was named, receiving the honor in 1926 for his World Court work.

The date of the presentation of the award to Lindbergh has not as yet been set.



## THE FUTURE OF COMMERCIAL AVIATION IS BEING DECIDED TODAY

I want a financier, president of a great railroad, in a thoughtless moment of irritation barked out, "The public be damned!" It was repeated. The public heard about it. And for thirty long, hard years the public gave the railroads a demonstration of the force of a vocal public opinion. It shook railroads to their deepest foundations and at one time or another nearly ruined them.

We have a wonderful example in the constructive force of public opinion in its reaction to aviation. Landing fields have sprung out of desolate tops, out of dense forests, even out of city congestion. Because public opinion has insisted on the side of aviation.

Because public opinion has willed the success of aviation.

Next time someone runs in front of your plane as you're taking off or landing, remember, when you speak to him about it, he's part of the public.

Next time somebody asks you a silly question—such as "How do you get down if the engine stops?"—remember it's prompted by interest in aviation, and requires a courteous answer.

Little things, to be sure. Hardly worth noticing. But it's the sum of these little things, plus the big ones, that make public opinion. And today's public opinion is deciding the future of commercial aviation.

The Ford all-metal monoplane has three engines. Its very appearance suggests safety. Its smooth, unvarying performance bespeaks safety. And public opinion starts with the recognition of safety.

Ford planes will help you to put public opinion on your side.

The Great Metal Airplane Company  
Division of  
**FORD MOTOR COMPANY**  
Dearborn, Michigan



## Commercial Plane Manufacturers Hold Conference at Wichita, Kan.

REPRESENTATIVES of twelve commercial airplane manufacturers held a conference at Wichita, Kan., on March 5 to appoint a committee which will represent the commercial and of the aircraft industry. Five men were chosen as a committee to lay out the general plan of the organization and to carry on the work. J. Don Alexander was appointed chairman, H. H. Duper vice chairman, while the remaining three members are T. F. Hamilton, C. J. Bruckner and A. J. Edwards. Jack Harding of the Aeronautical Chamber of Commerce, was elected secretary.

The movement to start an organization which would represent the commercial manufacturers started to earnest early last spring but did not come to a definite head until the aeronautical conference in Washington last fall. At that time it was decided after very considerable debate to have the organization a branch of the Aeronautical Chamber of Commerce rather than to have an entirely independent group. A drive was made for new commercial members for the Chamber and it was decided to hold an organizing conference in the West preferably at Wichita. The Aeronautical Chamber of Commerce appointed Jack Harding, the "Rascal of the World" flyer, to attend in the efforts of the commercial section, the idea being that they would have quite an independent organization as far as their own affairs were concerned but that at the same time they would profit by the experience and prestige of the older body.

The type of subjects which the organization expects to consider and take action on would include the following:

Standard form of sales contract (a) Agents (b) Direct sales to owner, form of guarantee, Commission to agents, Discounts to Commercial Aircraft Manufacturers, Discounts to Operating Companies and other fleet purchasers; Attitude on arrangements to dealers; Last price on repairs, replacement and accessories; General advertising in cooperation with other groups of the industry; Relations with Department of Commerce, Handbook Department of Commerce, Code of ethics (c) Advertising charges (d) Personnel questions; Freight rates; and General cooperation through the Chamber with other groups of the industry.

A more detailed account of the meeting and discussions will be published in the next issue of *Aviation*.

## New Company Plans Airport Chain To Reach from Maine to Florida

NATIONAL AIRWAY Terminal, Inc., of New York City, a new airport construction organization, announces that a chain of airports is to be constructed stretching from Maine to Florida. The first two years planned, three at Portland, Me., and Bridgeport, Conn., have already been designed. Wilmington, Del., will probably be the third in the system which is expected to represent an investment approximating \$5,000,000 when completed.

The Curtiss Flying Service is to supervise the first two fields of which the Portland Airport is in the best present condition. The field has three 3,200 ft. runways as well as a 10 plane hangar and laundry, houses, and approach lights. Day and night passenger and commercial flights, pleasure trips, and instruction will be carried on at the new sections. It has been further announced.

The principal officers of the corporation are president, William R. Arthur, president of the airport construction company bearing his name; vice president, C. B. "Coney" Jones, vice president of the Curtiss Flying Service; H. C. Farnham,

former member of Georges Guyonnet's flying squadron in the World War; and O. C. Eakley, secretary. W. R. Kopy, president of the Curtiss Aeroplane and Motor Co., is to act as director.

Officers of the Portland Airport include P. M. Poyan, president; Leslie P. Jacobs, treasurer; Chester A. Jordan, president of the Chamber of Commerce of Portland, and Guy P. Gossnell, president of the Gossnell Publishing Co. The officers of the Bridgeport Airport include Rex B. Delano, president; W. Donald Bryant, vice president; Andrew B. Smith, treasurer; and W. Parker Seely, secretary.

For the wide expression program planned by the National Airway Terminal new planes have been purchased. They include Fairchild cabin monoplanes and a number of new Curtiss "Bobcat" manufactured by the Curtiss-Helmer Aircraft Corp. of St. Louis, a company organized in cooperation with Colonel Lindbergh's backers—Harold G. Knight and H. W. Bixby, of that city.

## G. Elias & Bros., Inc. Plans Light Monoplane with Anzani Engine

G. ELIAS & Bros., Inc., of Buffalo, N. Y., has under construction a light convertible monoplane that will be powered with an Anzani 50 hp. engine. This model is to be known as the E.C.I. and can be purchased with either an open or closed cockpit. The closed model will be known as the "Air coupe" and is designed to have a high speed of 90 mph. and a landing speed of 25 mph. Upon completion of the design, a detailed technical description of this plane will be published in *Aviation*.

## Simplex Aircraft Corp. Organized In Ohio With Capital of \$100,000

THE SIMPLEX Aircraft Corp. was recently formed in Elyria, O., with a capital of \$100,000. The incorporation was E. J. Allen, vice president and general manager of the American Steel Package Co., Defiance, P. W. Allen, ex vice,



Side view of the Simplex "Red Arrow" monoplane, powered with a 250 hp. Warner R-2 engine.

and George H. Roberts of the same company. The new concern was formed after a series of tests had been made on a monoplane designed by O. L. Woodcock who was formerly located at Napoleon, O. It is understood that the engineers of the old Woodcock company are interested in the new concern. It is planned to produce five or three plane monoplanes powered with 250 hp. Warner R-2 engines. A detailed technical description of these planes will appear in an early issue of *Aviation*.



(A) Shows pattern of bridge assigned to Air Corps for destruction. (B & C) Show damage done by two 1100 pound bombs.

# DESTROY THE BRIDGE!

THE SWIFT ISLAND BRIDGE over the Pee Dee River must be destroyed to make way for a new water reservoir. The Army Air Corps is commissioned to bomb one part of the bridge.

Several 300-pound bombs are first dropped on the target. When the noise and smoke and dust have cleared away, the bridge is still there — almost unscathed.

Next, some 600-pound bombs. More noise, more smoke, more dust — and the bridge still stands, scarred and battered, but still a bridge.

Now — one 1100-pounder — and two whole spans are blown clean into the air, to disintegrate and settle in a crumbled mass. There is no longer a bridge over the Pee Dee River.

The 1100-pounder has turned the trick.

The new Curtiss Condor is the only American bomber that can carry two of these huge 1100-pound bombs and still meet (yes, and exceed) the new Air Corps specifications for bomber performance.

THE CURTISS AEROPLANE

Offices:  
Garden City, N. Y.

*Curtiss*

AND MOTOR CO., Inc.

Factories:  
Garden City and Buffalo, N. Y.



## Aviation in North China

Continued from page 426

One finds very few planes on the battlefield, but on the air field there are many planes being used by students and in a variety of ways commercially. The commercial business now exists for a larger group of people than ever before.

During my recent visit to the United States and Europe on behalf of Chang Tso Lun I visited airplane manufacturers and studied both European and American machines. Now I am convinced that the shipment of American planes to the Orient would be expedited if manufacturers took up with the state department the matter of shipping them for strictly peace and commercial purposes. What types will be developed for use in the Orient can only be conjectured. They now have both open and semi-open planes in China and all size single engine planes except the Vickers, some of which are in trial order. There is one of about the same type as the planes used between Paris and London.

I have been told by the instructors at Mukden that Chinese are developing into fairly good pilots. I have observed that they seem to have a good many crashes in the training phase, but whether this results from poor pilots or the equipment is not clear. There is a well equipped shop at the airfield and under the direction of the French instructors the student pilots are capable of repairing any of the planes.

In northern China the development of aviation has been under the able direction of the Soviet advisors. The number of planes and the type and the exact stage of development there I cannot say. A few planes are seen on the little front and I am informed that these have Russian pilots. Chang Tso Lun has about a dozen of the white Russians working here at Mukden. These are men who had experience in flying before the Russian revolution.

### Chinese Fear Fast Travel

But no regrets commercial flying, I believe when conditions permit it will become very popular. The Chinese in a way seem to be averse to time, and yet they desire to waste time in traveling. None of my acquaintances who have flown have given me the method of transportation and I believe this reveals the feeling of the class of Chinese who could not see this method of transportation.

Next to the Young Marshal, General K. P. Chow, in charge of the Mukden field, has worked steadily to "help the cause." He is a brilliant young Chinese, a capable flyer and learned flying rapidly under the tutelage of French instructors. The word "French" has occurred frequently in this article and it indicates the dominance of the French in north China aviation. With the start the French have in Manchuria and the fact that the Chinese now think in terms of French aviation and French ideas, it will be a difficult job for United States companies to compete in Manchuria for the next few years. Yet the fact that one order of airplanes to be shipped to north China under 130 machines gives some idea of the growing importance of this market.

Despite this apparent favoritism toward French machines, the Young Marshal is always anxious to give any new method of any new machine a chance. For that reason I think that if the state department will permit airplanes to be exported to China there will be little trouble in placing some machines in Manchuria as in northern China. The Young Marshal says: "This would be an important step in developing the Oriental market generally for American planes."

Although the Young Marshal is director of aviation, the progress made in North China in this line would not be possible without the consent and hearty cooperation of Marshal

Chang Tso Lun. The fact that he has placed his own, the "Young Marshal," in whom he has the greatest confidence, in charge of this branch of the service shows the importance he attaches to aviation. But who is this man who in 11 years has guided the people of North China? In my dealings with Chang Tso Lun I have during the last year become very close to him. As in the Chinese custom, among officials most important conferences take place in the early hours of the morning. I am never surprised to be summoned at 5 A. M. to the marshal's residence. At these conferences important matters are decided and it is at these times that the moving, shifting and one feels he really is in his confidence. It was at one of these times that the marshal approved his plans to develop aviation in China, not only as it has grown in Europe and the United States but according to his own idea that China will be connected by a network of airways. It believes his hope will be realized in the not-distant future. The Young Marshal's interest in aviation and his determination to develop it only reflect Chang Tso Lun's ideas.

At present, however, the Mukden airfield is the only one in North China or Manchuria equipped for all purposes. This does not mean, however, that there are not many good landing fields in China. Some of these are at Peking, Tientsin, Shanghai, Nanking and Yunnan. They are in a large field at Tientsin under the direction of the chief Chang Chang, the Shanghai province. The station is very modern. In fact there are very few flying stations in the whole of China that are as fine as this one in American hands. In fact, most of the gasoline is delivered in five-gallon cans.

## M.I.T. Students to Enter Glider In Competition Planned for April

BY RECENT vote of the members of the Aeronautical Engineering Society of the Massachusetts Institute of Technology, the club will enter a glider in the competition planned for this country in April by officials of the North American Lloyd Stoddard Line. E. H. Brown, chairman of the club of 1927 is chairman of the experimental committee and will have charge of the glider. The building of the craft is to be entirely done by members.

This club constructed the only American glider entered in the European meet of 1922. A plan for the competition has not yet been fixed, it is said, but the need of some of the best gliders are being considered, an investigation being carried on in this matter to find out exactly strong enough to support soaring flight.

## Worcester Flying Club Organized At Whittall Field Orders Waco 19

ORGANIZATION OF the Worcester Flying Club at Worcester, Mass., was recently announced by J. Henry Reynolds, president of the new group. The club, which is ordered a Waco 19 biplane, maintains headquarters at Whittall Field.

Membership in the organization is limited to 75, and it is stipulated that all must be licensed pilots or student pilots. Student members will take instruction from Francis Dwyer, who has been appointed club pilot. George Bacon has been named advisory pilot.

Honorary members are James P. and M. White Whittall and Louis Stewart Dickinson, flying instructor at Whittall Field.

by George H. Prudden, designer of the original Ford Air Transporter, the eight-place dual-control Prudden-San Diego Glider Transporter establishes a new high standard for commercial planes of equal capacity.

The Prudden is engineered to operate at minimum cost. Built largely of duralumin and steel, it takes a very low rate of depreciation. It is fire and weather-proof and virtually impervious to under protection from fire is afforded by the non-inflammable construction and an automatic Pyrene system. A wide marginal strength and almost unlimited endurance in both cases per part. Assembly for servicing is one hour per unit. As to performance, the Prudden takes off with a very short

run, turns perfectly with an easily adjusted stabilizer, is very responsive to control of roll and yaw, climbs with any two men, and lands on any spot that may be traversed landing field.

A large well-appointed cabin with separate toilet compartment, and an almost total absence of vibration and annoying sounds, provide real comfort for passengers.

The Prudden embodies every factor needed to win the confidence of a still cautious public and to show a profit on the investment. Write or wire for complete information.

PRUDDEN - SAN DIEGO AIRPLANE COMPANY  
SAN DIEGO, CALIFORNIA



**PRUDDEN**  
**ALL-METAL TRI-MOTOR**



### SPECIFICATIONS AND PERFORMANCE DATA:

TYPE	Alt-Block, Transporter
SEATING	8 Passengers, 1000 lbs. weight
WEIGHT	Empty: 10,000 lbs. Gross: 12,000 lbs.
WINGS	Span: 40 ft. 0 in. Area: 1,000 sq. ft.
WING AREA	1,000 sq. ft.
WING SPREAD	40 ft. 0 in.
WING LOADING	120 lbs. per sq. ft.
WING AREA	1,000 sq. ft.
WING SPREAD	40 ft. 0 in.
WING LOADING	120 lbs. per sq. ft.

TAKE-OFF WITH FULL LOAD	10 seconds
CLIMB	1000 feet per minute
ASBESTOS CEILING	15,000 feet
SERVICE CEILING	11,000 feet, full load
FUEL CONSUMPTION	24 gals. per hour
CRUISE CONSUMPTION	1.2 gals. per hour

ENGINE	Optional
CLAS	Supply plane and polished plane
WING SPREAD	40 feet
LENGTH	26 feet
LANDING WHEEL	14 feet

PERFORMANCE WITH TWO ENGINES:

Waco 19 and standard with any one engine

PRUDDEN - SAN DIEGO AIRPLANE COMPANY  
SAN DIEGO, CALIFORNIA





## The Supermarine-Napier S-5

Continued from page 651

and on each side. At high speeds the pilot can then lean forward through the glass and for landing, if he desires, he can move his seat outside the line of the fuselage to look downwards. The bird inside the body is said to tend to become troublesome in flight, and in addition there is always a certain amount of exhaust gas which finds its way into



The completed Supermarine-Napier S-5 ready for inspection and test flight

the cockpit. Fresh air ducts are thus provided at several places around the cockpit in order that conditions may not become unbearable for the pilot.

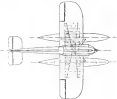
The fuselage is of monocoque construction with duralumin sheet forming the principal structure. The internal bracing consists of a number of channel section transverse frames in addition to four longitudinal stringers. In addition to the duralumin sheet frames that are spaced eight inches apart, are two heavier frames at the points of attachment of the spars of the wing. The engine mount is a cantilever extension in front of the fuselage. It consists of a continuation of the sheet of the fuselage supported by light internal members. Two of the longitudinal stringers are continued through the transverse frames or bulkheads to form the engine bearers. The covering is of single sheets of duralumin, except at the engine mount and between the wing spar supports, where it is of laminated sheets. It is stated that in some parts the thickness of the gauge duralumin are required.

The wing construction consists of two wood spars and the small drag members covered with 1/16 in. three ply underlath of the wing ribbing. Beyond the point of attachment of the external bracing an additional drag member is fitted between the spars to strengthen the wing against torsion. The external bracing consists of streamline wires. They are fastened to the spars at a point close to the middle of the wing, with the upper wires at their other end to the upper part of the fuselage, while the lower ones are attached to the pistons. It is usual practice in wing designers to have three present a corrugated surface which has more resistance than a flat surface. On the S-5 the skin of the radiator is entirely flat, as it is thought that about 75 per cent. of the resistance of a high-speed wing is skin friction and as the corrugations, should double the surface, it is worth-while to employ flat radiators. The main difficulty is in strengthening the rear member to stand the air loads without being unduly heavy.

The floats are of duralumin and are twisted to prevent corrosion. They are of single float design constructed entirely of duralumin except for the steel center section of the steel keel in which float is mounted. The structure consists of a central longitudinal bulkhead with light transverse

frames spaced at about two foot intervals. The transverse frames at the point of attachment for the floats are of a very much heavier than others. There are a number of additional longitudinal bracing fitted between the frames. The skin of covering the float is of duralumin sheet is said to have worked out very well. In addition to the other advantages just stated above, it is stated that when flying with full throttle, the lateral balance was so perfect that no use of the ailerons was required to counteract the engine torque. Each piston is attached fore and aft by wires, and the pistons themselves are braced with reference to each other by four lateral and diagonal wires.

A very interesting method of gasoline, oil, and water cooling system was worked out. An engine driven pump sends the fuel from the main pressure tank and delivers it to a small gravity tank at the fitting of the overhead cylinder block. From this gravity tank the fuel runs to the carburetor, an overflow is provided, carrying the excess fuel to the main tank. There is a number header in the forcing off of the overhead cylinder block for the cooling water, and here again an engine driven pump secures proper circulation. The oil cool-



Three new drawings of the Supermarine-Napier S-5

ing is carried out by means of specially constructed water running along the entire length of the rear portion to the floats.

As with all Napier-Leno engines, the wing spars are 12 cylinders arranged in three blocks of four cylinders each. The bore is 5 1/2 in. and the stroke is 5 1/2 in., while the compression ratio is 16 to 1. The overall dimensions of the engine have been considerably reduced. The height is 2 ft. 10 in.



## For air transport service

### THE PITCAIRN MAILWING

Carrying 500-600 lbs. payload, with high cruising speed, wide speed range, and a high degree of maneuverability, the Pitcairn Mailwing meets the exacting requirements of both day and night air transport service.

Powered with the Wright Whirlwind J-5-C Motor and fully equipped for night flying, the Mailwing has a maximum speed of 131 miles per hour, sufficiently high for the maintenance of schedules under all adverse weather conditions and for a high cruising speed in normal service.

The Mailwing, fully loaded, has a landing speed of 56 miles per hour and its wide track split axle undercarriage, pneumatic strut shock absorbers and wheel brakes allow for landings on the smoothest and roughest fields without injury to equipment.

Mailwings are now being used in regular service by four Contract Air Mail operators. Early delivery can be made on a limited number. Let us send detailed information.

**PITCAIRN AIRCRAFT INC.**  
LAND TITLE BUILDING, PHILADELPHIA, PA.



in, with 3 ft. 2½ in. and length 5 ft. 6½ in. The power of the engine is given above. The oil consumption is approximately three gallons per hour, while 50 gal. of gasoline are consumed.

The specifications of the biplane are as follows:

Span	26 ft. 9 in.
Chord	5 ft. 0 in.
Area of wing	115 sq. ft.
Span of stabilizer	7 ft. 8 in.
Area of stabilizer	22 sq. ft.
Area of elevator	5.5 sq. ft.
Area of rudder	5.5 sq. ft.
Length overall	24 ft. 2 in.
Wt. with fuel and engine	3500 lb.
Wt. with geared engine	3500 lb.
Wing loading (24 ft. span)	20.33 lb. sq. ft.
Wing loading (geared)	20.33 lb. sq. ft.
Landing speed	90 m.p.h.

## G. Elias & Bro., Inc., is Adjudget Winner in War Dept. Plane Test

OF 18 BIDS received by the War Department for the development of a primary training plane last fall, G. Elias & Bro., Inc., of Buffalo, N. Y., was recently adjudged the winner in a statement made by the Materiel Division, Wright Field, Dayton, O. The competition was open to all aircraft manufacturers.

Recommendations of the Board of Officers approved by the Secretary of War follow:

Name	Performance	Average cost	Maximum cost
G. Elias & Bro., Inc.	22	15	24
Consolidated Aircraft Corp.	21.5	12.5	18
The Douglas Co.	21.5	12.95	16.25
Keyhole Aircraft Corp.	21.5	12.5	15.5
Consolidated Aircraft & Motor Co.	21.5	12.5	15
Beech Aircraft Co.	21.5	12.5	14
Consolidated Aircraft Corp.	20	10.25	17.5
Bell Aircraft Co.	21.5	12.5	15.5
Buff Aircraft Co.	20	10.5	12.5

## Aircraft Engine Co., Oakland, Cal. Completes "Comet" Engine Tests

THE AIRCRAFT Engine Co. of Oakland, Calif., has completed tests on a seven cylinder air-cooled engine to be known as the "Comet". This power plant develops 150 hp. at 1800 r.p.m., having a displacement of 512 cu. in. and a compression ratio of 5 to 1. The engine is of clean design, with all accessories and push rods behind the cylinders. It is used by the manufacturer to have a dry weight of 356 lb., which gives a weight of 2.33 lb. per hp. A detailed description with photographs of the Comet engine will appear in an early issue of AVIATION.

## Captain Haldeman Now on Sales Staff of Stinson Aircraft Corp.

CAPT. ORRISON W. HALDEMAN, ex-pilot with Bob Elder in last fall's trans-Atlantic attempt, is now a member of the sales staff of the Stinson Aircraft Corp. of Detroit, according to a recent announcement of that organization. Captain Haldeman has been flying for 10 yr., having qualified as a pilot during the early days of America's entry into the World War.

## Stress Analysis in Commercial Aircraft

Continued from page 652

it, and it is used to be statically indeterminate. In most cases by reasonable assumption we cannot sufficiently near the truth can be obtained by applying the three equations to statically determinate structures. Where necessary the exact method for determining loads in indeterminate structures will be given. There are two methods of applying the equations to statically determinate structures, namely, analytical and graphical.

An approximate analysis of a wing from all known external dimensions, for the sake of simplicity, will be made.

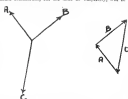


Fig. 1

to illustrate principles of mechanics involved. It is assumed that the truss is all in the plane of the paper. All members in the view shown in Fig. 2 are that of true length. All points are considered as pinned. The loads are distributed as shown.

To determine the reactions at C and F we employ the equations:

$$\sum M_C = 0$$

$$\sum M_F = 0$$

$$C_x \times 20 + A_x \times 20 + B_x \times 16 + D_x \times 20 + E_x \times 18 = 0$$

$$C_x \times 20 + 250 \times 20 + 250 \times 16 + 250 \times 20 + 250 \times 18 = 0$$

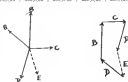


Fig. 2

$C_x = -1650$  the minus sign indicating that it is acting to the left causing a counter-clockwise moment.

Applying the equation  $\sum F_x = 0$ .

$C_x + F_x = 0$  since the reactions at A, B, D, and E are vertical.

$$-1650 + F_x = 0$$

$F_x = 1650$  acting to the right



# Now We're Coming!

## The Aircraft Industry "Steps Out" April 14-21!

ALL-AMERICAN AIRCRAFT SHOW — the year's biggest event in aircraft history! A "pageant of aviation" with the greatest collection of educational and historical material ever assembled! Manufacturers of aircraft, of parts and equipment from all over the country will exhibit at this

# All American Aircraft Show at Detroit

CONDUCTED under the auspices of the Detroit Board of Commerce. (For information, address Board of Commerce, Commerce Bldg., Detroit, Mich.) It has the co-operation of the Department of Commerce of the United States, the Aeronautical Chamber of Commerce of America and the National Aeronautic Association.

FOUR AIRCRAFT will be available for exhibitors who wish to show models, and four exhibitors who wish to land here, when coming to the show.

THIS WEEK in Detroit has been proclaimed "Aviation Week" by Mayor Lodge; the entire country is urged to join Detroit in its observance.

Thus applying the equation  $\Sigma A = 0$ ,  
 $A + B + D + E = 0$   
 $300 + 300 + 250 + 250 = 0$   
 $D = -1100$  acting down.

Thus our reactions at the point of support C and E are determined and the system is balanced.

The solution of the truss can be accomplished in several ways. First we will employ several variations of the analytical method.

(a) The analytical methods available are those of joints, shear, and moments. All three are merely the application

of  $\Sigma A = 0$ ,  
 $300 + 250 + AE = 0$   
 $AE = -550$  acting down.

As before the slope of 1.1 and  $AB_2 = AE = 550$

$AE = \sqrt{550^2 + 550^2} = 775$  lb Tension

Knowing that the loads at DE = 0, and AE = 550, by employing  $\Sigma H = 0$  we can determine AB

$\Sigma H = 0$   
 $BE + AE + AB = 0$   
 $0 + 550 + AB = 0$   
 $AB = -550$  acting left

Therefore AB acting to the left is pushing toward joint A and is in compression.

(3) Method of Moments. This method is used to determine the forces in any particular member of a truss without solving the forces in all the members of the truss leading up



to it. As before a series of the truss is taken as in Fig. 16. It is essential in cutting the truss that only those lines with unknown loads be crossed and that the two of these we are not investigating intersect at some point. Thus in Fig. 16 we are investigating member AE, and members AB and DE meet at point E. Then we can take moments about point E. The sum of the moments of the external forces and the moment of AD must equal zero.

$\Sigma M = 0$   
 $250 \times 10 = 250 \times 10 + AB \times 10 = 0$   
 $AB = -550$  lb acting left.

AB comes out negative indicating that it is acting to the left and causing a counter-clockwise moment. Once again since it is acting toward joint A it is in compression. Thus all these methods have shown the load to be a compression of 550 lb in member AB.

This method of moments is quick and may be employed and used in a long truss to determine the load in some special member. One must be careful in selecting it.



cutting line to be certain it cuts only three unknown members two of which meet at a point. Moments are then taken about that point. This eliminates two of the three unknowns.

Confirming the solution of the truss we have:

At joint E:  
 $\Sigma V = 0$

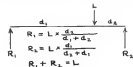


Fig. 6

of the three fundamental equations  $\Sigma H = 0$ ,  $\Sigma V = 0$ ,  $\Sigma M = 0$ . Usually a combination of methods is found best where the point is at all complicated.

(1) Method of Joints. This method may be employed on any joint where there are two unknown forces. Taking point D in Fig. 7 it is evident that the 250 lb. up load must be taken by member AD as member DE is horizontal and can and take any vertical load. We can now solve joint A as members AB and AE are the only unknowns. This joint is illustrated in Fig. 8.

Applying  $\Sigma V = 0$

$AE + 300 + 250 = 0$   
 $AE = -550$  acting down

Since the slope of AE = 1.1 then  $AE_2 = AE = 550$  lb.

Then  $AB = \sqrt{AE^2 + AE^2} = \sqrt{550^2 + 550^2} = 775$  lb Tension

AE is in tension because it is pushing away from joint A. Now for equilibrium of the joint AB must counter



Fig. 7

balance AE. This is easily applying  $\Sigma H = 0$ . Thus AB = -550 lb. Since it is acting towards AE, it is pushing toward the joint A and is therefore in compression.

Joint E may be checked next in the same manner. Here we know that AE = 775 lb tension, DE = 0. Then BE and EF are the only unknowns.

(2) Method of Shears. In a truss where the upper and lower chord members are parallel it is easy to determine the load in the diagonal member directly. A part of the truss is isolated as in Fig. 9 and the equation  $\Sigma V = 0$  employed.

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BE + 250 + 778  $\times \cos 45^\circ = 0$   
 BE = -800 lb. Compression  
 Since it is acting down towards the joint  
 it is 0;  
 EF + 0 - 778  $\times \cos 45^\circ = 0$   
 EF = 550 lb. Tension  
 Since it is acting to the right away from the joint.  
 it is 0.

At joint B:  
 BF = 0  
 BF  $\times \sin 45^\circ + 500 + 300 = 0$   
 BF = -500 lb. Tension acting down  
 it is 0;  
 BC + 800 + 1000  $\times \cos 45^\circ = 0$   
 BC = -500 lb. Compression acting left

For quick reference we may list our results as follows:

Member	Load in lb.
AB	-500
BE	-800
AE	-250
AD	+778
DE	0
BC	-1000
BF	+1000
EC	+500

- indicates a tensile load  
 + indicates a compressive load

In solving a truss if we assume any unknown force to be a tension the resulting sign will indicate the type of stress in the member. Thus if the result is +, our guess has been correct and the member is in tension; if the result is - the member is in compression.

(b) The graphical solution of the truss involves less arithmetical work, but very accurate drawing and scaling of lines

is necessary. Any determinate truss that can be solved analytically can be solved graphically as well. The graphical method is more often employed where the sides of the truss are not parallel.

Before solving a truss graphically it is necessary to make an accurate free drawing of the structure in scale with all external forces acting in their proper directions and in their correct locations. This has been done for our wire truss



Fig. 10.

in Fig. 10. The truss is then labeled so that each force and member has one letter, and only one, on each side. Then any two letters will designate a definite line. This is done correctly in Fig. 10. This method will be considerably in determining the location and character of loads in an airplane.

The reactions should be found as previously explained by an analytical method. A truss polygon may then be drawn taking all the external forces, including the reactions, in order and laying them out accurately in magnitude and di-

rection. If this polygon closes, the system is in equilibrium. In Fig. 14, ABCDEFGH is the force polygon for the system as applied to the truss in Fig. 10.

In solving a truss graphically it is very essential that we be isolated in our work. In laying out our external forces for our force polygon we must lay them out in order either clockwise or anti-clockwise. We can not jump around from one part of the truss to another. Similarly in starting a joint or end select one member as a starting point and then



Fig. 11.

joint clockwise or anti-clockwise around the joint laying out each member in order as we come to it. In all our work the clockwise order will be used in working around a truss as a joint.

The force polygon is constructed by starting with A-B and then taking B-C, C-D and so on in order around the truss. If these forces were all parallel we would get a straight line; in our case the polygon is an L-shape reversed. As long as we lay each force in the first as if it on A, the system closes and it is in equilibrium.

Now take the joint GHM for consideration. H-M and G-M are purely horizontal and can take no vertical load. H-M must then take the entire load G-H. This is shown in the diagram (Fig. 14) where M-H is represented on G-H. Drawing the joint directly above we now know the force in M-H, in A-B, and in M-A which must be zero. This leaves the members, B-C and C-D. The value for these we lay out 100 in direction and magnitude as in Fig. 14. Proceeding clockwise about the joint we next have M-A. This load is



Fig. 12.

we next have a point, A-B is next and is laid out from point A. Then from point B draw B-C indicating its length but in the same direction as in Fig. 10. Returning to our starting point I draw I-J from I until it intersects B-C. The point of intersection is J. Measuring the length of I-J and J-K will then give the loads that they carry.

Proceeding now to the joint POLK we have our next intersection with J-K and K-P so unknown P-Q is at hand but not on our force polygon. Q-R is a dot showing, what we already know, that the load is zero in that member. Q-R is already drawn from our previous joint. From R then we draw R-K, indicating its length but in correct direction. Returning to our original point P we draw P-K until it intersects R-K. The point of intersection is K. Scaling off the lengths of J-K and K-P will give the loads in these. The



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other joints are done in the same manner as illustrated in Fig. 14. If the polygon finally shows it is an inside sheet that the work has been done correctly. Any member on the inside polygon is in drawing the true members will cause a gap in the large polygon. In this case the entire process must be repeated until the system shows "no gap."

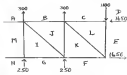


Fig. 12.

in the large polygon shows we know the system is not a polygon and therefore if our work is accurate the large polygon will fit the size shown.

When the polygon is complete each side line, as well as the lines at all vertices of the final board. It then is done with Fig. 13 it will be found that all the members line up in one value as previously found by the analytical method.

To determine whether the stress in a member is tension or compression we must use both Figs. 13 and 14. In Fig. 13 consider the members B-J and J-L. The members are

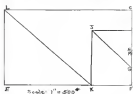


Fig. 13.

how are to be used in a clockwise direction. Thus the members are NOT I-J and J-L when referring to the joint I-J. Now, follow out the member B-J in Fig. 13. It runs toward the joint and is therefore in compression. Member J-L runs away from the joint and is in tension. As the joint J-L is the member I-J (which is reaching it clockwise for the next joint) runs away from the joint and once again it is in tension. Thus if our rule is followed it that the members should run toward the joint clockwise those members in tension will run away from the joint and compression members will run toward the joint.

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To be continued in the next issue of AVIATION.

## Methods of Standardized All-Metal Float Construction

Continued from page 657

the float in its correct position and there is no tendency towards sheet springing and resulting closing of joints.

The rear bottom sheet and then the front bottom bar sheet are next installed, followed by the keel and side spray sheets, all of which have been previously manufactured and kept in finished shape ready for immediate use. The light weight type pneumatic motor specially developed for this work and shown in use in Fig. 6 is used mainly for the setting of all straight lines in the operations shown.

The float in this present condition with all bottom sheets, keel and side spray strips coated in place is ready for "turn-on." After slowly releasing the series of men below the structure may be easily lifted from the primary position and placed in an upright position in a cradle jig shaped to fit the bottom of the float. With the float in this position, the next operation is to install and work the bow side sheets and middle row side sheets. The working operation on these sheets is easily accomplished through the use of the impact type pneumatic motor previously mentioned. With the side sheets oriented in place the sheets are next in line. It should be noted here that in standardized all metal float construction the side sheet works in an inverted joint of the rear and middle bottom sheets, that is, the longitudinal side flanges at these sheets form the side portion of the chest.

The chest angle and side sheet forming the chest area are fitted by means of a portable electric multiple speed drill of special design, capable of drilling four holes in one turn. This appliance is shown in Fig. 7. When the chest area is

completely drilled the holes are loaded with heat treated rivets and the backing bar assembled, shown in Fig. 8, are installed and secured in place against the rivet heads from the inside of the float. In this manner all of the chest rivets are automatically and perfectly drilled up at one time, allowing the riveter using the impact type pneumatic riveting machine to move the entire chest area run on both sides of the float.



Fig. 6. Machine operation of the impact motor of the float.

without a gap. This riveter is provided in its design with a clamp up each rivet with a drawing tool to provide sheet spreading between sheets. The backing bar arrangement mentioned in this operation might be well adapted to pneumatic operation should production requirements at any time warrant it. All of the pneumatic tools and other appliances

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used in the operations described in the preceding paragraphs are shown in use in the general view, Fig. 3.

With the chamber completely sealed and the welded stop cover plates installed, the float passes from the anodic oxidation jig to the anodic oxidation treatment. In treating this treatment is effective protection against corrosion and surface preparation for painting, it is immersed in an electrolyte bath in an immersion tank containing a chlorine and so-



Fig. 4. The light anisotropic type parametric oscillator is operated

lation and through it is passed an electric current of varying intensity which results in an oxide deposit which acts as a corrosion protective. The temperature of the chamber and solution is kept within prescribed limits by means of a series of electrical heating elements attached to the outside of the



Fig. 5. A portable electric multiple spindle drill device to drill four holes at a time.

chamber and water cooling coils installed inside the tank below the solution level. Self locking tackle blocks and a vertical working chamber adjacent to the anodic oxidation treatment tank facilitate the handling of the float throughout the entire operation of treatment.

From the anodic oxidation treatment the float is moved to a float type cradle carriage for water-tightness test. In this testing operation the float is completely filled with water and then carefully inspected and all leakage noted. It is interesting to note that the weight of the water contained in a float under this test is equal to twice the actual weight of the normal float to be carried by the float in actual service. After the pressure inspection is completed the float is quickly

March 12, 1938

AVIATION

663

emptied by means of a power driven centrifugal pump and all faulty floats detected in primary inspection are immediately replaced. The float is then completely refilled with water for final testing and inspection. It is to be noted here that from tests on water-tightness tests of standardized all metal floats over a period of 17 months show the percentage of defective floats found in these tests to be less than .005 per cent. Water-tightness of standardized all metal floats has been obtained through the use of close rivet spacing in all seams and no seam packing is used except at the bottom joints of three water tight bulkheads and at the top. At these joints rivets are spaced with Permalloy rivets and glass seal.

#### Islands Sprayed With Corrosion Preventive

From the water-tightness test the float is moved to the painting room for inside finishing. It is here given a thorough spray of a corrosion preventive, DuPont's Red Oxide Primer, over all of its inside surfaces. This heavy primer is effectively sprayed by means of an electrically heated DeVilbiss spraying equipment consisting of a heated spraying gun, heated hose and grease connections.

From the painting room the float returns to the cradle area for the installation of all deck sheets, which have been previously sand and given the anodic oxidation treatment and kept in finished stock. As the two side deck seams are of the crisscross overlapping type, all rivets in these are driven by means of the pneumatic automatic type machine shown in Fig. 2. First standard steel "U" plates are placed in position, accurately measured and riveted, the lower sheet joining and steel nose strip are installed and the standardized float is complete and ready for final exterior spray painting.

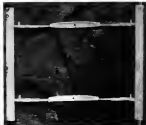


Fig. 6. Floating bar assembly.

Self locking tackle blocks and appropriate float design measures the handling of floats in the painting room. Care in the application of the priming coat of DuPont's Red Oxide Primer and two finishing coats of Barry's Blue Enamel.

All of the above-mentioned steel rivets necessary for the construction of standardized floats on the various commercial

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airplanes are made and accurately fitted to a structural steel master jig consisting of the fuselage attachment fittings in their proper relation to the attachment fittings on the standardized float. Typical welding and drilling jig used in the manufacture of standardized float struts are shown in Fig. 3.

As the ability of duralumin to resist corrosion in actual service depends largely upon the method of heat treatment



Fig. 3. Typical welding and drilling jig used in the manufacture of standardized float struts.

and quality of heat treatment of it during manufacturing operations, special attention was given to the heat treating equipment to be used in the manufacture of standardized floats.

A well insulated vertical steel tank, seven feet in height, having the shape of a frustrum of a cone, the smaller diameter being at the top to cut down radiation losses, has a cir-

cumference of 3506 lb of alkali salts. The tank of alkali salt is submerged in a pit below the floor level to keep the top of the tank in the correct working level. Due to the large volume of liquid alkali in the tank it is continuously heated to 250 deg. Fahrenheit by gas. The temperature is controlled by a built-in Brown pyrometer installation. A large water-quenching tank directly adjacent to the alkali tank completes the heat treating equipment.

#### Hand Riveting Largest Taper Factor

Nothing has been said in the preceding paragraphs concerning hand riveting. By numbers alone, the riveting is the majority of duralumin structures represents the largest factor of time necessary for final assembly and for this reason special attention has been given to the development of portable riveting tools to meet the particular conditions encountered in the manufacture of standardized all-metal floats. Hand riveting at this time, however, has not been entirely eliminated and a few figures based on the writer's experience with the use of duralumin construction may prove interesting. In 1929 when the pioneer work in duralumin flying boat hull construction was well under way, the number of rivets normally driven by a master and helper varied from 600 to 800 rivets per eight hour day, depending mainly upon the speed and dexterity of the helper in inserting and holding in the rivets. This average, the writer feels, can be increased in standardized float construction, by reason of greater simplicity of structure and longer straight runs, to an average of from 900 to 1100 rivets per eight hour day per riveting team.

The first step in improvement over hand riveting in final work was taken in the use of a Whitney ball bearing roller punch combined so as to be adaptable for riveting (Fig. 16). With a tool of this kind straight run rivets were

put in and driven at the rate of eight per minute or 7000 rivets per eight hour day per riveting team. Another variation of this improvement over hand riveting was in the use of a Porter Commercial bolt cutter using special jaws for rivets (See Fig. 11). On certain types of work this tool was capable of riveting at the rate of 24 rivets per minute or 2000 rivets per eight hour day per team. These figures, of course, based on time studies of particular riveting operations on detail parts over a period of ten minutes and on daily average figures computed therefrom are based on

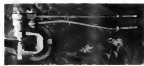


Fig. 16. Whitney ball bearing roller punch combined for use in riveting.

the assumption of continuous riveting, a condition which is not at all difficult to obtain. Through the use of the impact of hammer type pneumatic riveters, hand work has been largely replaced and an increase in speed of production of rivets has resulted per unit.

All construction jigs, fixtures and dies, etc., developed for the manufacture of standardized all-metal floats are so designed as to be universally adaptable to manufacture of all types and types of floats. In this connection a new type of universal riveting jig in use under development. This jig will consist of a rigid steel frame work which will carry the float under construction, supported inside two large support rollers and will rotate accurately and set ten feet



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## Side Slips

By ROBERT R. OGBORN

A short time ago there was an announcement in the papers that there had been insurance claims when a person speaking over the telephone could see each other. Judging by the following story, which comes to us from Mr. R. of the Department of Commerce, the telephone company may be trying the net on its security, and some sort of an insurance claim might be in order. It seems that M. M., manager of a famous flying service was enjoying a bath as he knew the other night when his wife reported that there was one on the phone who insisted on speaking to him. Adjoining himself with a steady hand, Mr. M. felt the tub to answer to it. It was a woman's voice and she had to risk a date with the trip. Mr. M. quoted the price and a lengthy argument started over it, the lady claiming it to be much too much. Finally Mr. M., who was getting a bit chilly as he September 1928, said, "I can't stand this kind of an argument with you." The prospective customer, as she lay up the motor, said, on a dejected voice, "hey, you're it, wait."

Mr. W. B., also of the Department of Commerce staff, reports the discovery of an honest mechanic who is about to start the automobile world, and will be glad to give his name to anyone needing his services. This chap, as his name is for a mechanic's license, and that one of the principal duties of an airplane mechanic is "to overlook the engine."

The story says of a New York paper recently featured the picture of a young lady who had just completed an airplane trip from coast to coast with the statement, "She was the first woman to have made this trip across the country only by a pilot." We hope that the F.B.I. will get the record of this woman, who she was, and get the prize money. It is this woman hasn't been getting the prize money lately.

The New York State Committee on Aviation recently reported to the Legislature that the public's attitude toward aviation was "a positive exception, with in the same spirit." The committee might have added too that many of the boys who have been watering the white elephants for so long will like to step inside the bag and enjoy the show a bit too soon.

Mr. B. B. made a description of an accident to a big way plane at an Army field, as reported in a tabloid newspaper—"The throbbing of the motor gradually agitated the throttle until the stick finally slid forward, giving the motor enough power to so increase the speed of the propeller that the plane began to move." Well, this way for the story as somebody told it, but one can't make an inference that the tail and engine don't contribute to that accident in some way.

At the University of California an average student will be scheduled and will be given flight training. He can if he can't completely complete a flying course in four hours time. If he can't see why it would not be able to pass a flying course in four hours, or it is about twice as much time as the average student allows in a total for studying to pass an other course.

## AIRPORTS AND AIRWAYS

### S. Paul, Minn.

The present hangar at the St. Paul Airport with a floor space of 75 by 200 ft., is inadequate in housing the airplanes, and it is the plan of the city to build another in the evening, incorporating many new practical features.

A Boeing biplane light type HO 100, one of the largest in the country, will be installed on top of the Mainland Building, about 300 ft. above the level of the field and another will be placed on the hangar. With the lighted roof, 20 ft. between reading SAINT PAUL on the hangar roof, is installation of ladder, observation, and flood lights in the air, it should be easy to locate and not down a place in the field during any time of the day or night.

F. J. Grogg, the airport master, plans to provide benches on one side of the hangar convenient for the spectators to sit with the flying activities.

The paved road that stops short as it enters the field will be made within the next three months, making for easy access to airport is wet weather. The field itself will be filled in and soil wherever eroded, and certain sections near the hangar will be sodded. A new type of snow plow has successfully used the field of snow during the major part of the winter. One of the members of Council, Harold E. Lyle, state-at-large, also, has stopped over here at the airport with Fokker University to be delivered at Wisconsin. E. W. Dwyer, president of the Both-Dwain Airways, in Minnesota and Dakota distributor for Travel Air, is a trip with Baskins in Canada to study the possibility of establishing an air route from the Twin Cities to Winnipeg by way of Fargo.

Steve S. Wall, chief pilot of the Both-Dwain Airways, is, and has been since 1924 and forced it to Colorado Springs in the past. On the way back to the Twin Cities he is going to the second Travel Air for the local distributor, then the factory in Wichita.

The National School of Aviation has been purchased by A. MacDonald and his associates of Minneapolis. They will use the Wald-Chambers Field as their base and will be the school, which has previously been at the Municipal airport in this city. There are 40 active students now receiving ground training.

N. Emerson and L. W. Dabbs, of the U. S. Weather Bureau, are stationed regularly in the hangar office at the airport and the observations of the upper air conditions. This service is best found to be of the highest value.

### Springfield, Mass.

Charles Hanson Cole

Announces that Springfield would be made the eastern terminal for the route of the Colonial Western Air Transport to make recently by officials of the Colonial company. Plans for the company flying outboard from Cleveland through Indianapolis, Schenectady and Albany, N. Y., will make this city terminal and eventually a connecting point with lines out to Boston and New York.

Installation of the line is scheduled for the early spring. Two rail. Preliminary plans and surveys for the service have been made and it is reported the line is awaiting the aid of warmer weather for the start. Parts of the Colonial Traffic's route are being operated at the present time,

but the complete plans will for its extension in this city.

This service will hang to Springfield, the first through mail and air express service. Local support to the air and has authority been specified on material had to be shipped by rail to Hartford, the nearest connecting point, and be transferred to the Boston-New York planes. A survey of the at the office of many large local concerns toward the service last summer indicated that the time consumed in the trip to Hartford was the chief obstacle in the growth of local passenger.

Massachusetts Airways, New England and Eastern Canada distributor of the Eagle, reported recently that in spite of numerous flying activities here during the winter the company has sold in addition all but three of the 18 planes to be delivered during April and May from Denver.

### Will Assemble at Randall Field

These planes will be delivered by freight, it was announced recently, as account of the difficulty in securing ferry pilots. They will be assembled at the Randall Field headquarters of the company, just down the road, and then delivered. Last year all the planes bought were flown here from Denver.

Further development of the Fiske Park flying project in this city induced by the Springfield Airport Corp. was assured recently when the city of Chicago, a leading city, granted permission for the removal of trees thought to be detrimental to safe operation of the field.

Fiske Park is bordered on one side by the old Chicago water supply reservation. The trees were not on the water shed and did interfere with take-offs and landings. The application was considered by the Chicago city officials about three months and favorable action was finally recommended. The agreement was reached, it was said, when the situation had been fully explained in the city officials and was said to

### "Lane Eagle"



Named for Col. Charles A. Lanbergh, "The Lane Eagle", one plane of the Ryan-McCormack-McCormack Co. of Los Angeles, is stationed at Paul Field in California.



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general manager of the Mid-West Airways Corp., talked to him the other day and it is expected that landing fields supplied with hangars and gasoline service facilities will be available this summer.

**Jackson, Miss.**  
By Map. A. J. Holfield

Steady progress is being made by the city engineers in obtaining the land and growing Jackson's recently purchased property for a Municipal Airport in shape to begin actual grading and construction. Specifications call for a Cline A. Field, in accordance with Department of Commerce regulations and Mayor Smith is determined that nothing short of that classification will do for the Capital City. There will be two runways each 2600 ft. in length. The field, which is approximately 3 1/2 miles northwest of the city, is confined as it now stands.

There are now two commercial companies doing business here. They are the Mississippi Airways, Inc., John D. Johnson, president, and the Whiteaker Flying Service owned by R. F. Whiteaker and A. J. Holfield. Johnson has been in the owner of a plane for a number of years. He has taken over the Eaglehawk franchise for the state.

Whiteaker of the Whiteaker Flying Service is an old pilot and has been operating in the state nearly a year. May 4, A. J. Holfield resigned his position as the Adjutant General's Office and associated himself with Whiteaker. They have the franchise for Warm airplanes for Mississippi.

A flying club organized early in the year by the Whiteaker Flying Service has been quite active. A plane is in service by the group.

Lester W. Stenz, Air Corps Reserve, recently became associated with the Mississippi Airways as chief pilot.

**St. Petersburg, Fla.**  
By G. P. Grog

At the annual meeting of the Aero Club of St. Petersburg the election of officers was the principal business before the meeting.

Rub C. Swadley was elected to succeed Col. Edwin Murphy as president of the club. Mr. Swadley is a member of the first group of war time fliers who, having returned to civilian life, is now back in the middle taking a new interest and so live part in things aeronautical.

Other officers elected were Ed Board, holder of light planes, as vice president, and Herman Gray, resident in secondary line.

Having the management and operation of the Paper-Fair Airport, the city's municipal flying field under its jurisdiction, the Aero Club plans the development of this field as a base A field with all facilities for both visiting and local planes.

Comprising a total area of over 200 acres of naturally drained land the field has three grass runways as follows: east and west 1000 ft., north and south 2000 ft., and a central runway northeast to southwest 2200 ft. The two former are each 500 ft. in width and the latter 400 ft. A 100 ft. wide creek at the head of the "L" serves as a marker.

The field is six miles west of the center of the city and adjoins the golf links of the Jungle Country Club overlooking Boca Ciega Bay.

**Blue Ash, O.**

Many changes are in progress at Watson Airport, Blue Ash, lying 12 mi. northwest of Cincinnati, in preparation for the opening of the new link in the New York Air Mail. The Continental Air Line Mail Co., operating the Cincinnati-Cleveland route will use Watson Airport as its base of operations.

To take care of the four new planes Travel Air and to provide room the expansion, Watson Airport is constructing a

Dark 12, 1932

new hangar 126 by 69 ft. It is expected that it will house 11 planes. It is being built on aerial plane suggested by the High Watson and will be constructed on the ground, or plane stand as it can be reached without leaving the earth.

In addition to the new hangar, extensive improvements are now made on the field. All hangars, buildings, and barns are maintained upon the runway will be moved back to a boundary line, providing ample runways on four corners, with a particularly extensive one against the prevailing winds. Plans are under way to take the field and build new runways up to the administration building.

Just across the runway stands at Watson Airport an airplane stand 34,000 ft. With the increased interest in aviation at Cincinnati it is expected that many more visitors will come via the 1932 warm season opens. Parking space to accommodate 1,500 cars will be arranged with ample room for equipment.

**Edfield, S. D.**

The first Travel Air to be sold by the Both-Davies Airways, Inc., St. Paul distributor of the plane, was bought by Herbert Lundberg and Ralph Haggins of Edfield. This Travel Air, which is a standard production three place open wingless plane, will be used by these pilots for student instruction, passenger carrying, etc.

The plane was ferried from Wichita to St. Paul by Ed and Will, chief pilot of the Both-Davies Airways, Inc., and on that point it was taken by these two fliers to their home town. As soon as the season opens in the spring at Goldenrod Lake, near Edfield, the Travel Air will be seen in use on frequently.

Edfield has about three years of flying to his credit, while his partner Lundberg has put in about 400 hr. during his last years of flying.

**San Arbor, Mich.**

Sam George Frick of the First Pursuit Group, Edinboro, Pa., addressed more than 500 Michigan State highway men and road commissioners here recently on "Aviation at Airports". Lieutenant Frick stressed the need of adequate landing fields near all cities and towns for the development of commercial and military aviation in the United States. He then drew Map Thomas G. Langford, commandant at Edinboro Field, planned to take a number of the young men and the West Coast to make a long-range flight from the Pacific Coast to the Atlantic in one day in order to demonstrate the ability of the Army air force.

The University of Michigan's third expedition to Greenland for meteorological observations may take an airplane as part of the equipment for exploring the island. If funds are used to fund to permit the construction of a plane equipped with off from land, water or ice before the expedition members go to Greenland in May, Prof. William H. Hobbs, Jr., one of the expedition, will order such a plane. However, the plane is not taken this year if it will be ordered for the next expedition which Prof. Hobbs will lead next summer. A design for a plane such as would be necessary for the island or work has been made by aeronautical engineers at Hammondsport, N. Y. It would be equipped with vane, landing wheels, and provision to be made landing directly on ice, land and water.

**Ironton, Mich.**

By John T. Knoll

A total of 265 passengers were carried by planes operated by the Stock Air Service, Inc., on the Detroit-Cleveland air line, during the month of January, Stanley B. Krohn, general manager of the company, announced recently. The company's business was an increase of 45 per cent, over the month carried during December, and brings the total number

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### Gettysburg, Pa.

31 C. McInerney, manager of the Gettysburg Airport, opened by the Gettysburg Flying Service on the Perry Farm Oak Ridge, has received from a trip through the field, to say which he reported airports throughout that section of the country.

This company has filed an official report of its activities with the Pennsylvania Public Service Commission at Harrisburg. It shows that more than 2,000 passengers have been carried for flights in the company's planes at the airport, a great majority of whom were taken for short rides over the battlefield.

A partial record of the company's own country today shows a log of 1,000 air miles. Berks, Pa., and Lancaster, Pa., are being used. Two students are enrolled at the company's flying school, one of whom, William White of Berksville, is ready for his first solo flight.

A new license has been completed at the Gettysburg airport by the Federal Gov. of Washington, D. C. It will be used for general school instruction purposes.

### Silverton, Ore.

The American Legion post is building an airport in the field chosen here 1800 ft. wide and 3000 ft. long. It is already in the path of the Pacific Air Transport and has installation of rest rooms, machine shops, hangars and other buildings and equipment in progress. Opening of a flying school is expected to follow completion of the field.

Officers and board of directors in charge of the field are Charles Reynolds, chairman and post commander of the post, J. T. Ties, general commander, J. C. Morgan, treasurer, and Clifford Rose, Vice President, Carper Tye and Ernest Stutz, members.

### Strevell, Idaho

The radio station of the Strevell Post, recently is now operation at an altitude of 5200 ft. J. L. Bassett is in charge. This radio receiving and sending set is 1000 ft. higher than the government radio station at Burley. It will be of great assistance in broadcasting accurate weather conditions in this dangerous part of country along the Salt Lake-Battle Mountain Pass.

Reserve Strevell is located in a section of the country where there are no power lines available. It was necessary to install two electrical plants as part of the equipment.

### Flagstaff, Ariz.

An air club has been organized here by Clarence Pullen, very successful instrument in promoting local interest in it. The club has a strong staff, housing 40 state members.

Approval of the new airport, which has been placed in D. Russell Shaw & Co. of Salt Lake, was given by the club at its first meeting. The members are enthusiastic over the "and" support and state that they will be a great asset to keep in the field for the use of the club.

### Yakima, Wash.

Yakima County officials have now completed the construction of 50 acres flying north of the city for an airport. A bench for \$7,000 was recently payable to W. C. Fyfe of Seattle, owner of the ground. The field has south of Yakima corner and is 3220 by 3610 ft. in size.

## UNITED STATES AIR FORCES

### Begin Delivery of Keystone Bombers

The first of more than a score of the latest type of bombardment planes, ordered by the Government for the Army Air Corps, recently landed at Bolling Field on its way to Dayton, O. The plane is being piloted by Lt. Col. Edwin R. McKeever. The "Pentecost," as it is called, is a variable flying fortress, capable of carrying more than a ton of bombs and can stay in the air from six to seven hours. Its cruising radius is about 500 mi. In other words, it can reach an objective 500 mi. from its take-off point, drop its deadly load, and return.

Twenty-five Pentecosts have been ordered for the Army Air Corps. They are built by the Keystone Aircraft Corp. of Bryn Mawr, Pa. Edward Gott of that company announced that deliveries will be made at the rate of one plane a week. According to present plans, nine Pentecosts will be stationed at Langley Field, Va., five in the Canal Zone, five in Hawaii, and five in the Philippines.

The new bomber is a biplane with a wing spread of 57 ft. and is powered with two Liberty engines and has a cruising speed of from 80 to 90 m.p.h. The Pentecost weighs 10,000 lb. and can carry 5,000 lb. of disposable load.

The plane carries a crew of five composed of pilot, bombardier who is also auxiliary pilot, front gunner, rear gunner, and radio operator.

### Air Corps Building Projects Approved

The War Department has approved the following Air Corps construction projects at a total cost of \$353,117.65:

Waltham, Pa., erection of hangar . . . . .	\$20,280.00
Kansas City, Mo., erection of headquarters building . . . . .	5,759.00
Edy Field, Tex., improvement structure range . . . . .	1,077.56
Sanford Field, Calif., remodeling hangar . . . . .	23,690.04
Perth Air Depot, Ohio, construction dog house . . . . .	13,695.94
Edy Field, Tex., installation of compressor house . . . . .	2,725.48
Langley Field, Va., completion night lighting system . . . . .	7,735.00
Waller Field, D. C., completion night lighting system . . . . .	6,000.00
Farfield Air Depot, Ohio, covering run hangar . . . . .	9,320.00
Sanford Field, Calif., construction dog house . . . . .	17,930.00
Danville Field, Ill., installation night lighting system . . . . .	5,277.00
March Field, Calif., installation night lighting system . . . . .	18,000.00
San Antonio Air Depot, Tex., addition to engine repair shop . . . . .	5,497.65

### Commissions Open to R.O.T.C. Men

Reserve Officers' Training Corps students who have deferred education at R.O.T.C. training camps will after graduation may now obtain commissions in the Officers' Reserve Corps upon completion of six weeks attendance at the Air Corps Primary Flying School under instruction supervised by Secretary of War Dwight F. Davis. Physical examination and recommendation of the commanding general of the Air Corps training center will be requisite for such commissions, and the students will be in the branch of service in which the student was trained at the institution from which he graduated.

### Langston En Route to Pacific Base

Sailing on her first official cruise, the U.S.S. Langston, sister ship of the U.S.S. Langston, is now on her way to the base at San Pedro, Calif. The Langston, which left Boston on Feb. 15, is to arrive on the Pacific Coast in April.

The surplus carrier left with her six planes, but 40 more were being taken on board at Pensacola, Fla. Capt. A. W. Kitchin is in command.



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- 5 First from San Francisco to Honolulu—with the U.S. Army Plaza
- 6 First in the Pacific trans-oceanic air derby—with Art Goebel winning the Delo prize flight from San Francisco to Honolulu
- 7 First in the New York-to-Spokane air race (1927)—with Charles Meyer, winner of Class B
- 8 First with pilots in the 1927 Ford Reliability race 79% of the entrants used Mobiloil
- 9 First with pilots in the National Air Races at Spokane in 1925 72.6% of the entrants used Mobiloil
- 10 First Down to Duck flight across United States—with Lesie. Morgan in 1924
- 11 First from New York to Buenos Aires—with the Argentine fleet Danco, Olvera & Casapelli
- 12 First flight around Europe linking all European capitals — with Capt. Stanovsky of Czech-Slovakia
- 13 First over the Andes Mountains — with Lesie. Doolittle
- 14 First around the Union of South Africa — with Major Miller of South Africa
- 15 First around Japan with the Japanese fleet

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